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REVISION OF THE NEW WORLD CHAETARTHRIA (COLEOPTERA: HYDROPHILIDAE)

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Abstract: The New World species of the genus *Chaetarthria* (Coleoptera: Hydrophilidae) are revised. Thirty two species are recognized and divided into five species groups, and the phylogeny of the New World species of the genus is discussed. The following twenty species are described as new: *argentina* (Argentina), *atroides* (Nebraska to Texas), *brasilia* (Brazil), *flava* (Mexico), *goldbachi* (Argentina, Brazil and Venezuela), *granulata* (Brazil), *hermani* (Argentina), *hespera* (southwestern United States), *hintoni* (Mexico), *lateralis* (Chile), *leechi* (California), *magna* (Arizona, California and Mexico), *major* (Honduras and Mexico), *malkini* (Brazil and Venezuela), *ochra* (Arizona, California and Mexico), *spangleri* (Honduras to Mexico), *spinata* (California), *truncata* (California), *utahensis* (Utah), *veracruzensis* (Mexico). *C. bicolor mexicana* Balfour-Browne is reduced to synonymy under *C. bicolor* Sharp, *C. minor* Fall to synonymy under *C. pusilla* Sharp and *C. panthea* d'Orchymont to synonymy under *C. panda* d'Orchymont. A key to species is provided along with descriptions, illustrations and distributional maps for each species.

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INTRODUCTION

The genus *Chaetarthria* was erected by Stephens in 1833 to contain only *Hydrophilus seminulum* Herbst. Subsequently a number of species, from most major areas of the world, have been named but no comprehensive study of the genus has been attempted. The extreme uniformity in external characters shown by these beetles makes it difficult to establish species differences or make determinations without examination of the male genitalia, and these have been described only for a few American species by d'Orchymont (1939) and J. Balfour-Browne (1939). The only available keys are those of d'Orchymont (1939) for six light colored American species and Leech and Chandler (1956: 343) for the three species then thought to occur in California. Fall (1901: 216) appears to have been the first author to point out the modified protibiae in males of many species. Leech and Chandler used only size and color in their key, while d'Orchymont used the aedeagus, the male protibiae, and the elytral vestiture.

Previously there have been twenty two apparently valid species named in the genus *Chaetarthria*, of which fifteen have been from the New World. The present study raises the known New World fauna to thirty two species, and undoubtedly there are at least several more which I have not had a chance to study. Indeed, several of the species treated in this paper, particularly some from South America, may prove to be composite when additional material is available for study.

BIOLOGY OF CHAETARTHRIA

Members of the genus *Chaetarthria* are tiny (one to three millimeters long), hemispherical, black to yellow beetles which usually burrow in the sand at the margins of streams or rivers, but beyond this virtually nothing is known of their biology. Mr. Hugh B. Leech, of the California Academy of Sciences, who has collected the genus extensively, states (*in litt.*) that he has always found them in sand containing little silt, never in mud, and always where the water was rather quiet. Since the beetles apparently remain in their burrows during the day and emerge onto the surface only at night, they are seldom seen by the casual collector although in many areas they are apparently not rare. Mr. Leech indicates that he collects them by pushing sand into the water and letting the beetles float to the top, and that it is difficult to predict where along the course of a riverbank they will be found. From Arizona south through Latin America some very long series have been collected at light traps.

The only published observations on these beetles, other than purely systematic works, appear to be those of Hrbáček (1943), who briefly reported the habits and life history of the European *C. seminulum* including a redescription of the larva, and a note by Schwarz (1914: 165) on the occurrence of what was probably *C. punctulata* or possibly *C. pusilla* (reported as *C. minor*) along a creek flowing from a hot spring in Arizona. I have seen material of both of these species collected by Hubbard and Schwarz in Arizona (USNM) but the label data are too imprecise to determine which specimens are the ones on which Schwarz' report is based. The stream at the point of collecting was apparently over 90°F, but nothing is said of the temperature of the adjacent sand.

There may be differences between species or even populations in their normal distance from the water. Hrbáček (1943) stated that neither the adults nor the larvae of the *C. seminulum* which he reared ever went *into* the water, but Mr. Jan Landin, of the University of Stockholm, informs me (*in litt.*) that the adults of *seminulum* occur in the water itself near Stockholm, Sweden. Dr. Lee Herman, of the American Museum of Natural History, has collected *pallida* on Hatteras Island, off the coast of North Carolina, in damp sand apparently not near any flowing water. Dr. Herman also informs me that at times the burrows of *Chaetarthria* are visible from above as humped up trails of sand, so that at times he has confused them with the burrows of the *Bledius* (Staphylinidae) which he was attempting to collect.

Ecological differences between the species may be rather subtle, as many series collected at one time and place contain two or more species and this is true for collections from the water's edge as well as from light traps. Mr. Philip Perkins, of California State University, Long Beach (*in litt.*) has found fairly good habitat segregation by carefully collecting the species found at a study site on the San Gabriel River, Los Angeles County, California, where the species seem to divide according to the coarseness of the substrate. Mr. Perkins has also reared *C. hespera* in the laboratory, and plans to describe the life history of this species and report on his ecological studies in the near future.

Examination of slide mounted specimens of several species of *Chaetarthria* has revealed that there is a patch of bumps on the under side of each elytron and a corresponding patch of ridges on the abdominal dorsum. These do not look like typical stridulatory structures, and live specimens of *Chaetarthria* have never been observed to make sounds. Thus, the function of these structures must be considered unknown. They could be sound producing structures,

however, and sound production is known in several genera of Hydrophilidae (Van Tassell 1965, Ryker 1972). In these genera sound functions in courtship and probably also in stress situations.

An obvious and interesting unique character of the beetles of the genera which make up the tribe Chaetarthriini (i.e. *Chaetarthria*, *Thysanarthria* and *Hemisphaera*) is the two masses of gelatinous material contained in a bilobed excavation of the first two visible abdominal sternites. Dr. Norman Saks, of the City College of New York, has determined the material in *Chaetarthria* to be a globulin protein, but nothing is known of its function. It has been speculated (Richmond 1920) that this structure might in some way be involved with carrying the egg cases around on the under side of the abdomen as in *Helochares*, etc. but this is denied by Mr. Perkins (*in litt.*), who has reared these beetles. Since both sexes possess the gelatinous mass, egg carrying is an unlikely function for it.

METHODS

Nearly all specimens were examined dry, on points, and most were dissected to determine sex and extract genitalia from males. Unfortunately it is not possible to know the sex of specimens of *Chaetarthria* externally unless one knows with which species one is working as a few New World species and all Old World species examined lack any external sexual dimorphism. Male genitalia were occasionally left attached to the beetle, but more often were mounted on a small point below the specimen. In most cases the aedeagus, despite being very small, is heavily enough sclerotized so that it maintains its shape upon drying. Where there were exceptions to this, as in *C. pallida* and other pale colored South American species related to it, where the parameres are largely membranous dorsally, or in *C. mexicana* and *C. bicolor* which have thin, wing-like parameres, and teneral specimens of other species, it was occasionally helpful to place a drop of ammonia on the aedeagus while studying it to help restore the normal shape. However in all cases the differences between species in the structure of the aedeagus are obvious even in dry specimens.

Measurements were made through the microscope (Leitz binocular dissecting microscope) using an ocular micrometer. Since the total length of the specimen can appear to be very different, depending on whether the head is extended or not, the elytral length (EL) was measured instead. This was measured in dorsal view along the suture and an attempt was made to position the specimen to be exactly horizontal since even a slight tilt can change the measurement some-

what. Greatest width (GW) is the combined width of both elytra at the widest point, generally slightly behind the base of the elytra. Greatest height (GH) is the distance from the elytral suture to the ventral edge of one elytron, measured in exact lateral view at the point where the beetle is thickest. The portion of the thorax which extends below the elytral edge was ignored in this measurement. The length of the parameres (PL) was taken in dorsal view. The ratio of the length of the male protibia to its greatest width was taken viewing the anterior face of the protibia. The ratio of the length of the basal piece to the length of the parameres was taken viewing the aedeagus from the side. The plates or discs on the inner face of the apical portion of the male protibia were counted. The plates, especially, must be counted with great care as the flat area of the protibia on either side of the row of plates can easily give the appearance of being an additional plate.

Distributional maps show males only unless females can be identified fairly certainly.

TAXONOMIC PHILOSOPHY

In general the species of *Chaetarthria* look very much alike, usable taxonomic characters being very few. Thus I have made the species descriptions fairly short, concentrating on the few diagnostic characters. As d'Orchymont (1939: 3) explained in discussing why he presented only drawings and a key to distinguish the species of his "*pallida* group," rather than full descriptions, "The descriptions would all repeat each other."

With the advent of current knowledge concerning polytypic and geographically variable species, it has become unwise for a taxonomist to erect new species on the basis of minor differences in specimens, especially when there is not enough material available to give a clear picture of the geographic distribution of the character states or of the presence or absence of possible intergrades. Thus in this work I have adopted the philosophy of a relative "lumper." Several of the species treated are shown to be variable and a few may prove to be composite once sufficient material is studied. In certain cases such as the North American *C. pallida*, *C. bicolor* and *C. pusilla* enough material was available so that the morphological forms were shown to geographically replace one another, thus corresponding to the concepts of subspecies and/or cline (however see discussion of variability in *pallida*). I do not feel that formal taxonomic designation of subspecies serves any important purpose, and it creates problems in nomenclature, so I have merely described the geographic variation in detail without naming the forms.

Less material has been available for the species from South America, so there are several species problems among them which have been less satisfactorily resolved. *C. panda* and *C. goldbachi,* as treated in this paper, both represent rather diverse groups of specimens and each might prove to be more than a single species when more material is studied. By contrast *C. hermani* is shown to be distinct, probably, from *C. argentina* because the two occur sympatrically, although the morphological differences between them are slight.

TAXONOMIC CHARACTERS

The species of *Chaetarthria* are quite uniform in appearance. Size is of value only to separate the largest and smallest species. Color has some value but generally only separates the species into a group which are yellow to light brown dorsally and a group which are dark brown to black dorsally, and *C. bicolor* includes populations which fit into each group. Very often there are larval mites under the elytra which, usually being whitish, make the elytral disc appear paler.

Punctation and pubescence differ slightly from species to species but they also often vary within species and thus are not diagnostic except in extreme cases such as the very evident, coarse vestiture of *C. granulata.* The apex of the elytron frequently has the punctures arranged subserially and these may continue to short longitudinal grooves at the extreme tip. In *C. truncata* and the darkly colored, northern populations of *C. bicolor*, these grooves are rather deep and are distinctive enough to aid in identifying the species.

In several species the head and pronotum have a very regular, fine and shallow micropunctation between the major punctures. This micropunctation is extremely close set, and d'Orchymont (1939) and Balfour-Browne (1939) have referred to the condition as microreticulate. These authors have used this as a species character, but several members of the genus from South America vary geographically and/or within populations in this respect.

Males present a set of primary and secondary sexual characters which are considerably more useful. As is often the case in the Hydrophilidae and in many other insects the aedeagus is distinctive for each species. In some cases it is geographically variable, but these differences are generally less than the differences between species. An exception to this is the fact that the aedeagus of *C. mexicana* differs from that of *C. bicolor* about as much as the geographic forms of the latter species differ from each other. Several species from South America have aedeagi which differ in different localities, but

the differences are slight and, except for the case of *C. hermani*, so little is known of the geographic distribution of the forms that it is not possible to prove that they represent separate species. This is more fully discussed in the previous section.

In most species the protibiae of the males are elbowed or at least sinuate on the inner margin, and the medial face of the apical portion bears spines, transverse plates or stalked discs (see for example figures 15, 20, and 80). Except for several yellowish to brownish species from South America, the structure of the male protibiae appears to be at least slightly different for each species although the differences may be only in the number of plates in some cases. These modifications are possibly aids to grasping the female during mating; the discs may function as suction discs for example. Structures of this sort seem to be common in water beetles, perhaps because the female water beetle would be wet while the male was grasping her. When there are plates on the protibia they are firmly and smoothly attached to the anterior margin of the medial face with their free, rounded edges often lifted well off the face of the protibia posteriorly. This smooth anterior attachment would seem to help protect the plates from being knocked off when the beetle burrows in the substrate, which would not be the case if the free edges of the plates were anterior. When there are stalked discs they are generally set behind a ledge or projection on the anterior edge of the protibia, which apparently protects them similarly. In *C. spinata* the middle legs of the males are also modified, the mesofemur bearing a broad, short tooth on its posterior margin which may also be of aid in grasping the female.

In *C. bicolor* and related species the males also have the metasternum modified in that there is a longitudinal row of three or more bristles, slightly larger than the surrounding hairs, on each side of the metasternal midline, near the posterior of the segment. I am unable to offer any good suggestion as to the possible function of this structure except that it also might be involved in holding the female securely during mating.

THE GENUS **CHAETARTHRIA** STEPHENS

Chaetarthria Stephens, 1833, p. 22. Type species: *Hydrophilus seminulum* Herbst, 1797 (cited as Paykull, 1798). For misspellings see Knisch, 1924, p. 224.

Cyllidium Erichson, 1837, p. 211. Type species: same as above.

DESCRIPTION: Approximately hemispherical to oval beetles 1.1 to 2.5 mm. in length with head deflexed, capable of rolling up slightly.

Head reddish brown to black, eyes usually somewhat protuberant from sides of head. Antennae eight segmented,[1] basal segment very long, bowed with center pointing anteriorly, second nearly globular, third through fifth tiny, sixth through eighth forming pubescent club. Labrum transverse, bearing thick brush of long, golden hairs along ventral margin. Maxillary palpi three segmented, usually short and thick, middle segment less than half length of others. Labium slightly broader than long, palpi three segmented, usually short, middle segment much longer than others, apical segment bearing tuft of hairs longer than segment. Dorsum variable from smooth and glabrous to rather weakly punctate and pubescent, pubescence and punctation of elytra generally stronger than that of head and pronotum. Pronotum black to yellow, transverse. Scutellum triangular, slightly longer than basal width. Elytra black to yellow, without striae except sutural ones but sometimes with several short grooves at apex, sutural striae traceable from apex for less than half to about three quarters of way to base, elytral margin beaded and with single row of golden setae just mesad to bead. Venter black to dark reddish or yellowish brown with appendages and prosternum often paler. Mesosternum with small, pointed, pyramidal elevation medially just anterior to mesocoxae. Prosternum and metasternum with no keels or other modifications. Procoxae transverse, oblique, fairly prominent, very narrowly separated. Prothoracic and mesothoracic femora with hydrofuge pubescence. Metathoracic legs usually not pubescent, bearing only a few scattered hairs, mostly along inner surfaces. Tarsi all five segmented, with all segments short and broad. Abdomen with large, bilobed, common excavation of first two sternites filled with mass of hyaline material, first sternite with row of punctures bearing long, golden hairs directed posteriorly, ventral to hyaline mass. Aedeagus consisting of basal piece, parameres, and penis, together more or less cylindrical, not flat, though parameres and penis occasionally so, basal piece curved or bent dorsoventrally and longer than parameres.

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[1] D'Orchymont (for example 1926, p. 242, 1928, p. 89) considered the antennae to be nine segmented, but I have examined slide mounted specimens of *C. seminulum* and of several New World species and have counted only eight segments in each. Hrbáček (1948, 1950) illustrated the antennae of *seminulum* as clearly eight segmented, although the genus is mislabeled in the 1950 paper due to a scrambled caption for the figure. The confusion seems to lie in the area between the globular second segment and the club, where I count only three segments.

SPECIES GROUPS AND PHYLOGENY

Phylogenetic speculation on the basis of as few characters as are currently available in *Chaetarthria* is both difficult and dangerous. Nevertheless the present study has given some information which can be used to divide the New World species of the genus into groups and to erect a provisional, partial phylogeny. I hope that other workers will search for additional characters and examine additional species from other areas, to test the system here presented. Two areas which might yield valuable information are the detailed study of slide mounted adult mouthparts and the study of the morphology of immature stages (almost none of which are yet known). Dr. Lee Herman, of the American Museum of Natural History, New York, and I have examined slide mounted females of several species for the spermatheca, since this character has proved valuable in the study of the phylogeny of other Coleoptera (see for example Herman, 1972, on *Bledius*) but have been unable to find any discrete sclerotized structure.

Currently a controversy is raging as to whether all classifications must be strictly phylogenetic in the sense of Hennig (1966). I do not believe that they must be, since a classification is not, *per se*, a phylogeny. A classification and a phylogeny each convey specific, different types of information. A phylogenetic diagram is particularly concerned with the time sequence in which groups of organisms diverged from each other, while a classification is more useful if it is allowed to reflect the degree and importance of changes along a particular phylogenetic line. Thus we may separate off into a separate taxon a group of species which share some particular evolutionary advancement even though the resultant taxon is not strictly a "sister group" of another taxon at the same level. My view is quite similar to that of Ashlock (1971, 1973), who would accept both taxa which are strictly monophyletic (i.e. which include all the descendants of a common ancestor; he calls this holophyly) and taxa which are paraphyletic (i.e. which include part but not all of the descendants of a common ancestor *which had those apomorphic characters which unite the taxon*). This question has been repeatedly discussed in the literature, particularly in the pages of *Systematic Zoology* (see for example Nelson, 1971, 1973, and Colless, 1972).

The species treated in this study are divided into five species groups. The *nigrella* group is monophyletic because it contains only one species. The *bicolor* group is probably monophyletic because it contains all species which have bristles on the male metasternum, and the *atra* group is probably monophyletic because it contains all

species with flat plates on the male protibiae. Neither of these characters is likely to have evolved twice, so the *bicolor* and *atra* groups are probably not polyphyletic.

The *spangleri* group is probably paraphyletic, since it contains part but not all of the species with stalked discs on the male protibiae. This character probably evolved only once, so the *spangleri* group is not likely to be polyphyletic, but since the members of the *bicolor* group also have these discs, the *spangleri* group is probably not strictly monophyletic.

Members of the *glabra* group have no synapomorphic characters except those of the genus as a whole. Thus this group appears to be paraphyletic, since it is not likely that the generic characters evolved more than once.

In order to determine which characters are apomorphic and which are plesiomorphic in New World *Chaetarthria* several Old World species of the genus and of the closely related genus *Thysanarthria* were examined, as follows: 1) *C. seminulum* Herbst, from Europe 2) *C. indica* d'Orchymont, from India 3) a species from the Philippines which is very similar to *indica*, differing only in the apices of the parameres, and may not be specifically distinct 4) two probably undescribed species of *Thysanarthria* from Ceylon. The characters of these species are presented in tabular form below.

Character	*Thysanarthria*, two species	*C. indica* and species near it	*C. seminulum*	Probable plesiomorphic state, new world *Chaetarthria*.
Male protibiae	Unmodified	Unmodified	Unmodified	Unmodified
Color, head	Black	Reddish brown	Black	?
Color, pronotum and elytra	Yellow brown	Reddish brown	Dark reddish brown	?
Pubescence of elytra	Fairly strong	Nearly glabrous	Nearly glabrous	? Nearly glabrous
Punctation of elytra	Fairly strong	Almost none	Strong and even	?
Elytral striae	Ten striae on each elytron	Sutural striae only	Sutural striae only	? Sutural striae only
Proportions of parameres	Longer than wide	Longer than wide	Wider than long	?
Metasternal bristles, males	Absent	Absent	Absent	Absent

The only one of the above characters which seems useful for phylogenetic speculation is the condition of the male protibiae; the presence of an elbowed inner margin and/or the presence of plates or discs apparently represent advancements over the primitive condition for the New World species of the genus. The presence of larger bristles on the male metasternum also seems to be an apomorphic character which defines a monophyletic species group of New World species, the *bicolor* group.

It is not known where *Chaetarthria* originated or how many phylogenetic lines within the genus have spread to the New World. However since neither *Thysanarthria* or *Hemisphaera*, the closest relatives of *Chaetarthria*, occur in the New World I will assume that the genus originated outside the New World and, further, assume that the genus invaded the New World only once. The only reason for the latter assumption is that it simplifies the phylogeny by allowing me to leave out species from outside the geographic area under consideration; study of the fauna worldwide may show that this is incorrect and force interpolation of Old World species into the family tree.

The hypothetical ancestral New World chaetarthrian, then, probably lacked any modification of the male protibiae or metasternum, and, less reliably, may have been a beetle which was nearly glabrous dorsally and lacked any striae or apical grooves on the elytra except the sutural stria. The members of the *glabra* group fit this criterion except that *C. truncata* has apical elytral grooves, and this group seems to be the most primitive in the New World. Additional characters which they possess include a brown to blackish dorsum, with the head in some species not darker than the rest of the dorsum (in all other New World species the head is black), and the rather flat parameres together forming nearly a square. The members of this group are from Central America and Mexico except *C. truncata* from California. It is possible that the genus may have entered the New World via the Bering Strait, undergone an initial radiation in western North America, and then been pushed south to Mexico and Central America by the Pleistocene glaciations, with *C. truncata* representing a species which avoided the glaciers by restricting itself to high altitude refugia instead of southward migration. There is little hard evidence to support this historical view, but it is certainly a fairly common sort of evolutionary history among organisms of western North America. From the few characters available to work with, I am unable to speculate further as to relationships of the species within the *glabra* group.

In figure 1 the proposed phylogeny is presented and the evolutionary advancements are shown as numbers. Thus number 1 repre-

sents the development, in the *nigrella* group and all further groups, of the elbow on the inner margin of the male protibia. In *C. nigrella*, the only member of its group, the inner face of the apical portion of the male protibia is provided with a single enlarged, flat spine. These changes probably represent the initial evolution of a "no slip" device to facilitate mating, which has been further refined in the remaining groups. *C. nigrella* occupies the western United States, and probably extends into Mexico.

From the *nigrella*-like condition the male protibiae appear to have been further modified in two different directions, one line developing a series of flat, slanting plates on the inner face and the other developing a series of stalked discs in the same area. I can not determine whether one of these conditions evolved from the other or whether each developed separately from the *nigrella*-like condition.

The line which developed plates on the male protibia (3, figure 1) is the *atra* group, which also appears to have originated in North America and has subsequently invaded South America. Within the group there seem to be two subgroups of closely related species, and several species that are loosely related to one or the other of the subgroups. The first of the subgroups consists of *C. atra*, *atroides*, *hespera*, *spinata* and *leechi*. All are dorsally dark colored and have the parameres more or less elongate, parallel sided, and split into dorsal and ventral sclerotized plates separated by lateral membranous regions (4, figure 1)[1]. Since these species approximately replace each other geographically throughout the United States (and probably northern Mexico), they may have evolved by geographic speciation from a single widespread species. *C. leechi*, however, differs enough in the structure of the aedeagus that it may be more distantly related to the others.

C. pusilla is similar to the above group of species but is much smaller and has the parameres and penis much reduced in relation to the basal piece although still constructed on the same general plan (5, figure 1). This species extends throughout much of western North America and all of Central America, and shows geographic variation. Thus it may be a sister group to the above group of species.

C. brasilia, from Brazil, and *C. lateralis*, from Chile, may also be related to this subgroup, representing one or two invasions by it into South America, but they do not have an aedeagus built on the general plan described above. It is also possible that they are members

[1] This character of being laterally membranous appears, however, in several other species in other groups.

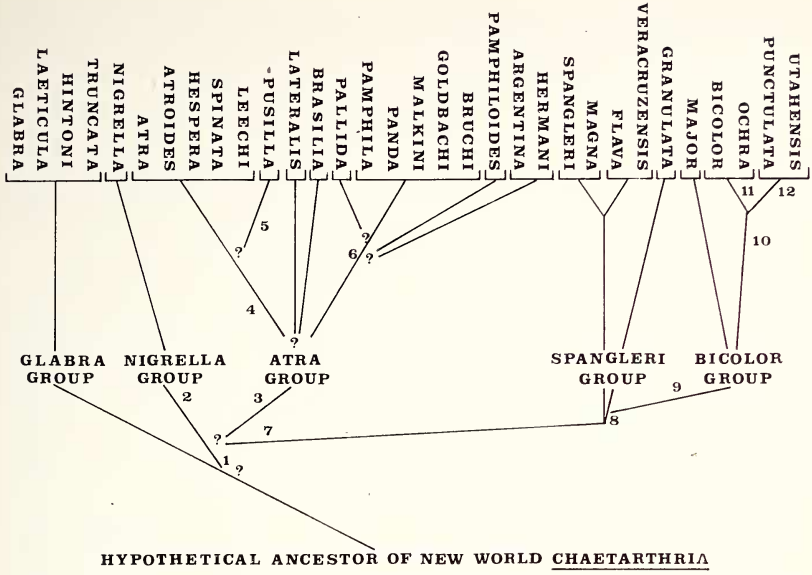

FIG. 1. Proposed phylogeny of new world *Chaetarthria*. Numbers refer to the occurrence of morphological changes, as follows: 1. Male protibiae elbowed; 2. Male protibiae with single large spine; 3. Male protibiae with slanting plates; 4. Parameres largely membranous laterally; 5. Parameres reduced, basal piece elongated; 6. Parameres largely membranous dorsally; 7. Male protibiae with stalked discs; 8. Discs of male protibiae reduced to two; 9. Male metasternum with larger, yellow bristles; 10. Discs of male protibiae reduced to one; 11. Parameres wing shaped; 12. Parameres unequal.

of the following subgroup which have become dorsally dark colored; at the present time I consider their affinities to be very uncertain.

The second subgroup within the *atra* group is entirely South American except for *C. pallida*. *C. pamphila*, *argentina*, *pamphiloides*, *panda*, *malkini*, *goldbachi*, *bruchi*, and *pallida* are all dorsally yellow to brownish yellow and are so similar that they appear closely related. Little can be said of relationships between them except that *pallida*, *pamphila*, *panda*, and *malkini* all have the center of the dorsal surface of each paramere largely membranous (6, figure 1). *C. goldbachi* is similar but has smaller membranous areas. *C. hermani* is dark brown dorsally but is obviously close to *argentina* since the aedeagus of these two species differs only in proportions.

C. pallida might have diverged from the remaining species of its

subgroup prior to the entrance of the subgroup into South America. I consider it more likely that the species reinvaded North America, is now undergoing geographic differentiation, and may eventually become a group of three species.[2]

The other modification of the male protibia is the development of discs on short stalks on the apical portion (7, figure 1). This is shown by the *spangleri* and *bicolor* groups. In the *spangleri* group there are from two to five such discs on each protibia, and in the *bicolor* group there are only one or two discs on each protibia.

The *spangleri* group consists of four species in southern North America to Central America, and one, *C. granulata,* in Brazil. The group probably originated in North or Central America with *granulata* representing an invasion of South America. Among the remaining species of the group, *C. spangleri* and *magna* are similar in having a large aedeagus with the parameres separated at the tips, but the proportions of the aedeagus are quite different. On the other hand *flava* and *veracruzensis* are probably very closely related as they have a very similar aedeagus and appear to replace each other geographically. The final species of the group, *granulata,* has two male protibial discs (8, figure 1) but is placed in the *spangleri* group because it lacks the metasternal bristles which define the *bicolor* group (9, figure 1).

Finally, in addition to the metasternal bristles the *bicolor* group all have two discs on each protibia (*C. major*) or only one (10, figure 1). Among the four species with single discs, *bicolor* and *ochra* appear closely related because of their wing shaped parameres, and *punctulata* and *utahensis* appear closely related because both have unequal parameres. All known members of the *bicolor* group are from North or Central America.

It should be emphasized that the above scheme is highly speculative. In some cases I have had to select from nearly equally likely possibilities, but I have tried to point out the uncertainties in each case. Finally, it is interesting that these beetles appear never to have invaded the West Indies; no specimens are known from any of those islands.

KEY TO THE NEW WORLD SPECIES OF CHAETARTHRIA

The species of *Chaetarthria* found in the New World are difficult to identify without reference to the aedeagus. It is recommended that all determinations made with this key be checked carefully

[2] It could be argued that this speciation has already occurred; see further discussion under *C. pallida.*

against the diagnosis and the figures of the protibia and aedeagus. Females taken unaccompanied by males should be considered only tentatively identified except for those few species in which the females have distinctive characters.

1. From North or Central America 2
From South America 40

2(1). Protibiae elbowed or rounded on inner margin and/or with one or more flat plates on medial or posterior face of apical portion (figs. 15, 19 to 21, etc.) (males) 3
Protibiae with sides evenly divergent from base to apex, lacking special plates or discs (figs. 4, 5) (females, some males) 19

3(2). Medial face of apical portion of protibiae with single large, flat spine (fig. 15); elbow of protibia slightly distad of middle; dorsum black to dark reddish brown, sometimes with vaguely to clearly defined pale border on sides and elytral apex; head and pronotum micropunctate (sometimes very faintly); elytra usually 1.4 to 1.6 mm. long; western North America ..... *nigrella* (LeConte)
Medial face of apical portion of protibiae with plates or discs (figs. 20, 80, 99, etc.) 4

4(3). Apical portion of protibiae with series of flat, slanting plates (fig. 20, etc.) 5
Apical portion of protibiae with one or more stalked discs (figs. 80, 99, etc.) 11

5(4). Dorsum yellow or brownish yellow, except head black; protibiae elbowed near middle with three plates on apical portion; elytra usually 1.1 to 1.6 mm. long; widespread in North America ..... *pallida* (LeConte)
Dorsum black to reddish brown 6

6(5). Elytra generally 1.1 to 1.3 mm. long; protibiae elbowed at about basal third, apical portion with five or six plates; northern California to Costa Rica, east to Texas ..... *pusilla* Sharp
Elytra usually over 1.5 mm. long 7

7(6). Protibiae elbowed at about basal quarter (fig. 19), apical portion with nine to eleven plates (fig. 20); eastern United States and Canada, west to about central Oklahoma, Kansas and Nebraska ..... *atra* (LeConte)
Protibiae elbowed beyond basal quarter (fig. 21, etc.) 8

8(7). Mesofemur with broad, shallow tooth on posterior margin (fig. 29); protibiae elbowed slightly proximad of middle (fig. 30), apical portion with ten to thirteen plates, elytra usually 1.7 to 2.1 mm. long; central California near coast ..... *spinata*, new species
Mesofemur not toothed 9

9(8). Protibiae elbowed at about basal third, apical portion with eight

or nine plates; elytra usually 1.8 to 2.1 mm. long; Trinity County, California ..... *leechi*, new species

Protibiae elbowed beyond basal third 10

10(9). Elytral apex slightly attenuate, with clearly defined pale border at sides of pronotum and elytra and about apical quarter of elytra; protibiae elbowed just proximad of middle (fig. 21), with seven or eight plates on apical portion; elytra usually 1.8 to 2.0 mm. long; central Texas to Nebraska ..... *atroides*, new species

Elytral apex not attenuate, without clearly defined pale border; protibiae elbowed at about middle (fig. 27), apical portion usually with five plates (fig. 28), occasionally six or seven; elytra usually 1.5 to 1.7 mm. long; southwestern United States ..... *hespera*, new species

11(4). Apical portion of protibia with single small, stalked disc near apex (figs. 99, 103) 12

Apical portion of protibia with two or more stalked discs (figs. 80, 92) 15

12(11). Dorsal surface, except head, yellowish without darker clouding or markings except elytral humeri and scutellum often marked with brown; protibiae rounded at about apical fifth, not sharply elbowed (fig. 104), disc somewhat proximad of apex (fig. 103); metasternum usually with double row of larger, yellowish bristles in posterior quarter; elytra usually 1.6 to 1.8 mm. long; central California to northern Mexico, east to Arizona ..... *ochra*, new species

Dorsal surface, except head, reddish brown or, if yellowish, pronotal disc usually clouded with brown; metasternum always with double row of larger, yellowish bristles in posterior quarter, sometimes hard to see 13

13(12). Protibiae slightly sinuate on inner margin, not sharply elbowed (fig. 100), disc very near apex (fig. 99); dorsum yellow to nearly black, if very dark elytral apex with several deep, short, longitudinal grooves and pronotum with narrow, clearly defined pale border; elytra usually 1.3 to 1.6 mm. long; northern California to Costa Rica, east to central Texas .. *bicolor* Sharp

Protibiae sharply elbowed on inner margin (fig. 110); dorsum, except head, reddish brown to nearly black 14

14(13). Elytra usually 1.5 to 1.7 mm. long; protibiae elbowed at about middle (fig. 110); Utah ..... *utahensis*, new species

Elytra usually 1.3 to 1.5 mm. long; protibiae elbowed between middle and apical third (variable); southern California to central Mexico, east to Texas ..... *punctulata* Sharp

15(11). Protibiae rounded at about apical fifth, not sharply elbowed, with two discs near apex (figs. 91, 92); dorsum, except head, dark reddish brown to nearly black; metasternum with double row of larger, yellowish bristles in posterior quarter; elytra

usually 1.6 to 1.8 mm. long; central Mexico (Sinaloa) to Honduras ..... *major*, new species

Protibiae fairly sharply elbowed before apical fifth, with three or more discs on apical portion (figs. 79, 80) 16

16(15). Protibiae with three discs on apical portion, elbowed somewhat distad of middle; dorsum slightly brownish yellow, except head; elytra usually 1.4 to 1.5 mm. long; Veracruz State, Mexico ..... *veracruzensis*, new species

Protibiae with four or five discs on apical portion 17

17(16). Dorsum, except head, dark reddish brown to nearly black; protibiae elbowed just distad of middle, with four discs on apical portion (figs. 79, 80); elytra usually 1.7 to 1.9 mm. long; southern California and Arizona to northern Mexico ..... *magna*, new species

Dorsum yellowish, or specimen from south of Mexico 18

18(17). From Sonora or Sinaloa, Mexico; dorsum, except head, yellow without brown shading or marking on pronotum; protibiae elbowed at about apical third, apical portion with four discs, elytra usually 1.4 to 1.7 mm. long ..... *flava*, new species

From southern Mexico or Central America; dorsum, except head, yellow often marked with brown on pronotum, to brown; protibiae elbowed at about middle (fig. 73), apical portion with four or five discs; elytra usually 1.5 to 1.7 mm. long ..... *spangleri*, new species

19(2). Dorsum entirely smooth and shining, almost completely without punctures or vestiture; dorsum including head reddish brown; rather strongly convex beetles, greatest height/elytral length usually over .7; elytra usually 1.0 to 1.1 mm. long; Panama to Nicaragua (males and females) ..... *glabra* Sharp

Dorsum with at least some fairly evident punctation and vestiture seen under good magnification, particularly on elytra; greatest height/elytral length usually under .6 20

20(19). Elytral apex with several short, deep striae; dorsum mostly blackish 21

Elytral apex without deep striae except sutural, although sometimes with shallow grooves or slightly raised areas 22

21(20). Head and pronotum strongly micropunctate; elytral apex broadly and sharply paler; elytra usually 1.3 to 1.5 long; central California (males and females) ..... *truncata*, new species

Head and pronotum lacking micropunctation; elytra sharply but narrowly paler at sides and apex; elytra usually 1.3 to 1.5 mm. long; central California (females) ..... (in part) *bicolor* Sharp

22(20). From east of line drawn through central Oklahoma, Kansas, and Nebraska; dorsum largely reddish brown, elytral apex often diffusely paler; elytra usually 1.6 to 1.8 mm. long (females) ..... *atra* (LeConte)

From west of such line or south of Oklahoma, or dorsum mostly yellowish 23

23(22). Dorsum, except head, dark brown to black, often with diffuse to distinct pale border; pronotum lightly micropunctate; elytra usually 1.4 to 1.6 mm. long; western North America (females) ..... *nigrella* (LeConte)

Dorsum largely yellowish, or pronotum not micropunctate, or elytra usually over 1.7 mm. long 24

24(23). Elytra usually under 1.3 mm. long[1]; dorsum, except head, dark brown 25

Elytra usually over 1.3 mm. long or dorsum largely yellowish (females) 27

25(24). Narrower, less convex beetles, greatest width/elytral length usually under .86, greatest height/elytral length usually under .56; dorsum, except head, usually dark reddish brown, head black; elytra usually 0.9 to 1.3 mm. long; central California to Costa Rica, east to Texas (females) ..... *pusilla* Sharp

Broader, more convex beetles, greatest width/elytral length usually over .86, greatest height/elytral length usually over .56; dorsum mostly brown to reddish brown 26

26(25). Elytral punctation fairly evident; dorsum, including head, shining light brown to fairly dark brown; elytra usually about 1.1 mm. long; Mexico State, Mexico (males and females) ..... *hintoni*, new species

Elytral punctation shallow, not very evident; dorsum reddish brown except head sometimes black; elytra usually 1.0 to 1.1 mm. long; Guatemala and Panama (males and females) ..... *laeticula* Sharp

27(24). Dorsum reddish brown to black; western United States or northern Mexico 28

Dorsum lighter than reddish brown or not from western United States or northern Mexico 34

28(27). Pronotum and elytra with definite pale border including about apical quarter of elytra; elytra usually 1.7 to 1.9 mm. long; central Texas to Nebraska ..... *atroides*, new species

Pronotum and elytra usually at most diffusely paler at sides and apex 29

29(28). Dorsum, except head, brownish black, diffusely paler at elytral apex and sides of pronotum; elytra about 2.0 mm. long; Trinity Co., California ..... *leechi*, new species

Dorsum, except head, reddish brown, not usually blackish, or elytra less than 1.5 mm. long 30

30(29). Smaller beetles, elytra usually 1.3 to 1.5 mm. long; dorsum

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[1] The smallest specimens of *C. punctulata* incorrectly key here and can not be separated from *pusilla*; they differ from *laeticula* by their stronger punctation and from *hintoni* by their black heads.

reddish brown to nearly blackish; southern California to Mexico and Veracruz States, Mexico, east to Texas ..... *punctulata* Sharp

Larger beetles, elytra usually over 1.5 mm. long 31

31(30). Utah; pronotum and elytra fairly light reddish brown; elytra of male 1.5 to 1.7 mm. long, but female unknown ..... *utahensis*, new species

West or south of Utah, or elytra and pronotum darker than light reddish brown 32

32(31). Smaller beetles, elytra usually under 1.75 mm. long[2]; pronotum never with micropunctation; southwestern United States north to central California and east to Oklahoma, and probably in northern Mexico ..... *hespera*, new species

Larger beetles, elytra usually over 1.75 mm. long 33

33(32). Pronotum very lightly micropunctate, this micropunctation sometimes very hard to see; dorsum, except head, dark brown with pronotum yellowish laterally, elytra usually not diffusely paler apically; elytra usually 1.7 to 1.9 mm. long; Sonoma and possibly Mendocino Counties, California, near coast ..... *spinata*, new species

Pronotum not micropunctate; dorsum, except head, reddish brown to nearly black, elytra usually diffusely paler apically; elytra usually 1.7 to 2.1 mm. long; southern California and Arizona to northern Mexico ..... *magna*, new species

34(27). Dorsum, except head, shining dark reddish brown[3]; elytra usually 1.7 to 2.0 mm. long; central Mexico (Sinaloa) to Honduras ..... *major*, new species

Dorsum, except head, yellow to yellowish brown 35

35(34). Smaller beetles, elytra usually under 1.45 mm. long[4], or from central or eastern United States; pronotum sometimes micropunctate 36

Larger beetles, elytra usually over 1.45 mm. long; pronotum never micropunctate; western United States or Mexico to Central America 37

36(35). Dorsum, except head, yellowish with pronotum often clouded with brown and darker than elytral disc; specimens from central to northeastern United States micropunctate on pro-

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[2] The largest *C. hespera* and the smallest *spinata* and *magna* will key incorrectly using this character; *spinata* can usually be distinguished by its very lightly micropunctate pronotum but females of *hespera* and *magna* seem to differ only in average size.

[3] The dark Costa Rica populations of *C. spangleri* key here but the dorsum is less shining and the elytra are under 1.7 mm. long.

[4] Extremely small specimens of several species and extremely large specimens of others key incorrectly here, so that if size is used at this point, the diagnosis should be carefully checked after a determination is reached.

notum; elytra usually 1.2 to 1.5 mm. long; widespread in North America ..... *pallida* (LeConte)

Dorsum, except head, yellow to yellowish brown, pronotum sometimes clouded with brown but not usually darker than elytral disc; pronotum never micropunctate; elytra usually 1.2 to 1.6 mm. long; California west of Sierra Nevada Mountains to Costa Rica, east through southern California to Texas ..... *bicolor* Sharp

37(35). Dorsum, except head, pale, without darker shading or marking except scutellum and humeri often marked with brown; elytra usually 1.7 to 1.9 mm. long; central California to Sonora, Mexico, east to Arizona ..... *ochra*, new species

Dorsum, except head, darker yellow to brown, often clouded or marked with brown; Sonora or south of Sonora 38

38(37). Sonora and Sinaloa, Mexico; dorsum, except head, yellow, not marked with brown; elytra usually 1.5 to 1.8 mm. long ..... *flava*, new species

South of Sinaloa, Mexico; dorsum, except head, almost always brownish or with brown markings 39

39(38). Veracruz State, Mexico; dorsum, except head, slightly brownish yellow; elytra usually 1.5 to 1.6 mm. long ..... *veracruzensis*, new species

Mexico south of Veracruz, to Costa Rica; dorsum, except head, yellow to brown; elytra usually 1.4 to 1.7 mm. long ..... *spangleri*, new species

40(1). Very small beetles, elytra usually under 1.3 mm. long; dorsum dark brown to nearly black 41

Larger beetles, elytra usually over 1.3 mm. long, or dorsum, except head, yellowish 42

41(40). Dorsum, except head, shining dark reddish brown except diffusely paler at sides and apex; nearly glabrous; elytra usually 1.1 to 1.3 mm. long; Matto Grosso, Brazil ..... *brasilia*, new species

Dorsum, except head, reddish brown except pronotal disc and scutellum blackish; head and pronotum dull and granulate appearing, micropunctate; vestiture evident and regularly arranged; elytra usually 0.9 to 1.1 mm. long; Matto Grosso, Brazil ..... *granulata*, new species

42(40). Dorsum blackish except sides and elytral apex sharply paler; elytral apex slightly attenuate and bent sharply down so nearly perpendicular to venter; elytra usually 1.6 to 1.7 mm. long; Cautín, Chile ..... *lateralis*, new species

Dorsum, except head, yellow to dark brown, never with distinct pale margins and never with elytra bent sharply down at apex ..... 43[5]

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[5] Females are difficult to identify past this point in the key.

43(42). Dorsum, except head, dark brown; male protibiae with four plates; elytra usually 1.2 to 1.5 mm. long; Tucumán and La Rioja Provinces, Argentina ..... *hermani*, new species

Dorsum, except head, brown to yellow, male protibiae usually with five or more plates 44

44(43). Dorsum, except head, light to fairly dark brown; male protibiae usually with five plates; elytra usually 1.3 to 1.7 mm. long; Tucumán Province, Argentina ..... *argentina*, new species

Dorsum, except head, brownish yellow to pale yellow; male protibiae usually with five or more plates 45

45(44). Elytral vestiture evident under oblique lighting, made of flat hairs nearly half as broad as long; male protibiae usually with five plates; elytra usually 1.1 to 1.3 mm. long; Matto Grosso, Brazil ..... *pamphila* d'Orchymont

Elytral vestiture sparser and less evident, individual hairs less than a third as broad as long; male protibiae with more than five plates ..... 46[6]

46(45). Males with central portion of each paramere a soft, dull appearing membrane with reticulate surface, often becoming somewhat deformed on drying (figs. 59, 63, etc.) 47

Males with central area of each paramere smooth, slightly shining, not deformed on drying (figs. 69, 71) 49

47(46). Males with apex of each paramere slender, elongate (fig. 59); protibiae with six or seven plates; elytra usually 1.1 to 1.4 mm. long; Paraguay, Goias, Brazil and possibly Alagoas, Brazil ..... *pamphiloides* d'Orchymont

Males with apex of each paramere broad, not elongate (fig. 63, etc.) 48

48(47). Parameres about .22 mm. long; male protibiae elbowed at about basal third, with six to nine plates; elytra usually 1.2 to 1.4 mm. long; pronotum not micropunctate; Matto Grosso and Goias, Brazil, and Venezuela ..... *malkini*, new species

Parameres .26 to .39 mm. long; male protibiae elbowed at about middle, with seven to nine plates; elytra usually 1.5 to 1.7 mm. long; pronotum sometimes micropunctate; Tucumán, Argentina to Matto Grosso, Brazil, and probably also Uruguay and Peru ..... *panda* d'Orchymont

49(46). Apex of each paramere obliquely truncate (fig. 71); male protibiae usually with six or seven plates; elytra usually 1.5 to 1.7 mm. long; Tucumán and Cordoba, Argentina ..... *bruchi* Balfour-Browne

Apex of each paramere elongate, rounded at tip, with small bump on medial margin (fig. 69); male protibiae usually with seven to ten plates; elytra usually 1.2 to 1.7 mm. long (in

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[6] Females can not be keyed beyond this point.

Argentina 1.5 to 1.7, in Brazil 1.2 to 1.5); Matto Grosso and Goias, Brazil, Tucumán, Argentina, and Venezuela ..... *goldbachi*, new species

DESCRIPTIONS OF SPECIES

THE GLABRA GROUP

DIAGNOSIS: Dorsal surface brown to black, head colored as rest of dorsum in some species, black in others; protibiae of males not elbowed and without apical bulge on inner margin (fig. 4), and lacking special armature on inner face; male metasternum without larger bristles; parameres together forming nearly a square (fig. 2, etc.).

This group of four species occurs primarily in central Mexico to Central America with one species in central California. Because of the lack of modifications of the male protibiae, it appears to be the most primitive group in the New World.

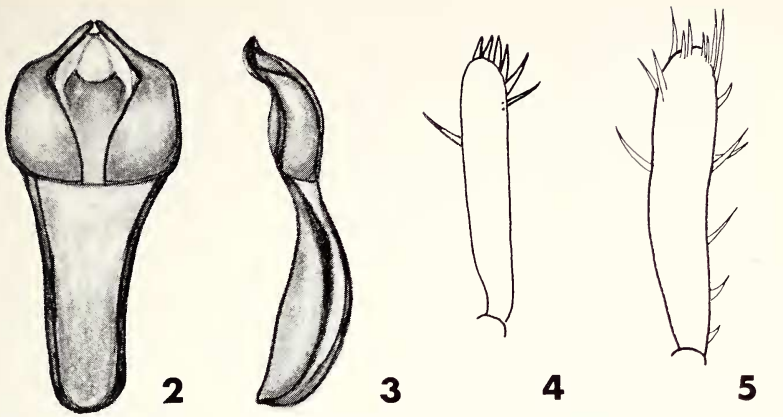
Chaetarthria glabra Sharp
(Figures 2, 3, 4, 5, 6)

Chaetarthria glabra Sharp, 1882, p. 87. Type locality: Chontales, Nicaragua. Type male and two female paratopotypes in British Museum (Natural History). Type examined by Mr. Harry Kenward and paratopotypes by me for this study. Sharp, 1887, p. 768.

DIAGNOSIS: The dark reddish brown color of the dorsum including the head, with the shining, nearly impunctate and glabrous surface, and the convex shape when viewed from the side separate this species from all others. The aedeagus is also distinctive. Elytral length is generally from 1.0 to 1.2 mm.

DISTRIBUTION: Panama Canal Zone to Chontales district, Nicaragua.

MALE [based on specimen from Paraiso, Canal Zone, Panama, January 16, 1911, E. A. Schwarz (DM)]: Shape nearly circular, very convex. Dorsal surface entirely dark reddish brown, including head, smooth and shining, almost completely impunctate and glabrous except labrum with many small punctures, elytral apex lacking grooves or raised areas. Ventral surface yellowish brown with maxillary palpi and antennae except club more yellowish. Legs each with one or two particularly long spines on inner margin of tibiae but lacking secondary sexual modifications. Aedeagus in dorsal view with parameres broad, together forming nearly a square with a short point at center of apical side, inner margins strongly divergent to near apex, then strongly convergent to tip; penis exposed between parameres,



FIGS. 2–5. Fig. 2. *Chaetarthria glabra*, aedeagus, dorsal. Fig. 3. same, lateral. Fig. 4. same, left protibia, anterior face. Fig. 5. same, left mesotibia, anterior face.

broadly triangular, tip elongate and broadly emarginate dorsally at apex; basal piece elongate, widest at junction with parameres, rounded at base; in lateral view basal piece slightly curved, if straightened out would be about one and one-half times length of parameres; parameres with dorsal margin curving ventrally from base, flattened at tip.

FEMALE [based on specimen with data as male above (USNM)]: Externally identical to male, including tibiae.

VARIATION: No appreciable variation is present in the specimens I have seen, but Mr. Kenward reports that the type has the pronotum "dark yellowish brown" and the rest of the dorsum "near black." See also "Species A" in "Specimens of Uncertain Placement."

SPECIMENS EXAMINED: 22 males, 22 females. COSTA RICA: *Puntarenas*: Rincon de Osa, July. NICARAGUA: *Chontales*: No further data. PANAMA: *Archipielago de las Perlas*: San Miguel. *Canal Zone*: Bohio, February, April. Paraiso, January, April. *Panama*: Madden Lake, near dam, February, damp leaves and debris in stream bed.

Chaetarthria hintoni, new species
(Figures 6, 7, 8)

DIAGNOSIS: The brown coloration of the dorsum including the head, together with definite elytral punctation, distinguish this species from all others in the New World except *laeticula* Sharp; this latter species has the elytral punctation somewhat less definite than *hintoni*.

FIG. 6. Distribution of *Chaetarthria glabra* and *C. hintoni.*

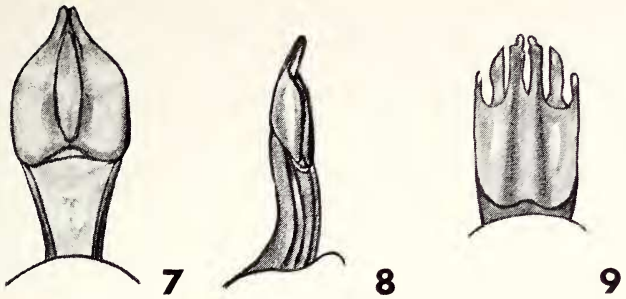
Because these two species are quite similar examination of the aedeagus is recomemnded. Elytral length is generally 1.1 to 1.2 mm.

DISTRIBUTION: Known only from Tejupilco, Temescaltepec, Mexico state, Mexico.

HOLOTYPE: Male, Tejupilco, Temescaltepec, Mexico state, Mexico, June 18, 1933, H. E. Hinton, R. L. Usinger (BM). Shape broadly oval and rather convex. Dorsal surface entirely light brown, shining, head very finely and sparsely punctate, except labrum more closely so, pronotum like head, elytra with somewhat coarser and thicker punctation becoming subserial apically, alternate irregular rows of punctures bearing very fine hairs. Ventral surface light reddish brown, antennal club slightly darker. Legs without secondary sexual modifications, protibiae with one slightly longer spine on inner margin. Aedeagus in dorsal view broad and flat, parameres broad, considerably attenuated along inner margin at tip; basal piece elongate, margins somewhat concave, widest at junction with parameres; in lateral view basal piece slightly curved, if straightened out would be about one and one-half times length of parameres; parameres convex ventrally, apical third much thinner. EL 1.09 mm., GW .96 mm., GH .62 mm., PL .18 mm., GW/EL .89, GH/EL .58.

ALLOTYPE: Female, same data as holotype (BM). Externally like holotype, including tibiae. EL 1.14 mm., GW .98 mm., GH .67 mm., GW/EL .86, GH/EL .58, PL .18 mm.

VARIATION: A single female (BM), with data identical to the other specimens of *hintoni*, has the head and elytra considerably darker and the pronotum slightly darker than in the other specimens.



FIGS. 7–9. Fig. 7. *Chaetarthria hintoni*, aedeagus, dorsal. Fig. 8. same, lateral. Fig. 9. *C. laeticula*, aedeagus, dorsal.

It also has a fairly sharply defined pale border occupying the apical quarter of the elytra and slanting forward along the sides. All other characteristics are typical of *hintoni*. This specimen may represent a distinct species, and has been labeled as a manuscript species by Mr. J. Balfour-Browne, but since color variation parallel to this can apparently occur in other species of the genus (see *nigrella* (LeC.) and *bicolor* Sharp, for example) I have labeled this specimen "? *hintoni*" pending the discovery of males with this coloration. The specimen is excluded from the paratypes.

PARATYPES: 1♂, 2♀♀, same data as holotype (BM, DM).

Chaetarthria laeticula Sharp
(Figures 9, 10)

Chaetarthria laeticula Sharp, 1882, p. 87. Type locality: San Geronimo, Guatemala. Type female in British Museum (Natural History). Type examined by Mr. Harry Kenward and paratypes by me for this study. Sharp, 1887, p. 768.

DIAGNOSIS: The reddish brown dorsum and small size (elytral length generally 1.0 to 1.2 mm.) separate this species from all others in Central America except *hintoni*, which has stronger elytral punctation than *laeticula*. *C. glabra* Sharp is similar in size and color but lacks elytral punctation almost entirely. Examination of the aedeagus is recommended, as it is also distinct in having each paramere apically trifurcate. See also *pusilla* Sharp.

DISTRIBUTION: San Geronimo, Guatemala, and Archipielago de las Perlas, Panama, but see also "Variation."

MALE [based on paratype from San Geronimo, Guatemala, Champion, Biologia Centrali-Americana Collection (BM)]: Shape

FIG. 10. Distribution of *Chaetarthria laeticula* and *C. truncata*.

broadly oval and fairly convex. Head black, nearly impunctate and glabrous. Pronotum, scutellum and elytra reddish brown, pronotum nearly impunctate and glabrous, elytra with shallow punctures distributed in vaguely subserial pattern with alternate, less regular rows bearing tiny, very difficult to see hairs. Ventral surface reddish brown. Legs without secondary sexual modifications. Aedeagus in dorsal view broad and flat, each paramere trifurcate at tip with lateral most branch narrow and thumb-like, next branch broader and blade-like, and inner branch with tiny elbow on lateral margin near apex; basal piece strongly tapered toward base of aedeagus; in lateral view basal piece narrowed at base, about half of length of entire aedeagus; parameres narrowed at tip.

FEMALE [based on paratype, data as male above (BM)]: Externally like male, including tibiae.

VARIATION: The pair from Pearl Islands, Panama are smaller than the Guatemalan paratypes and have the heads brownish, as in the other two species of the *glabra* group, rather than black as in the

Guatemalan *laeticula*. This suggests that they represent a separate species but the complex aedeagus is identical to that of the Guatemalan male, so I am retaining the material within a single species until enough material is available to make it possible to study geographic variation in some detail.

SPECIMENS EXAMINED: One male and one female paratype, plus one male and one female probably of this species. GUATEMALA: *Baja Verapaz*: San Geronimo. PANAMA: *Archipielago de las Perlas*: San Miguel.

Chaetarthria truncata, new species
(Figures 10, 11, 12)

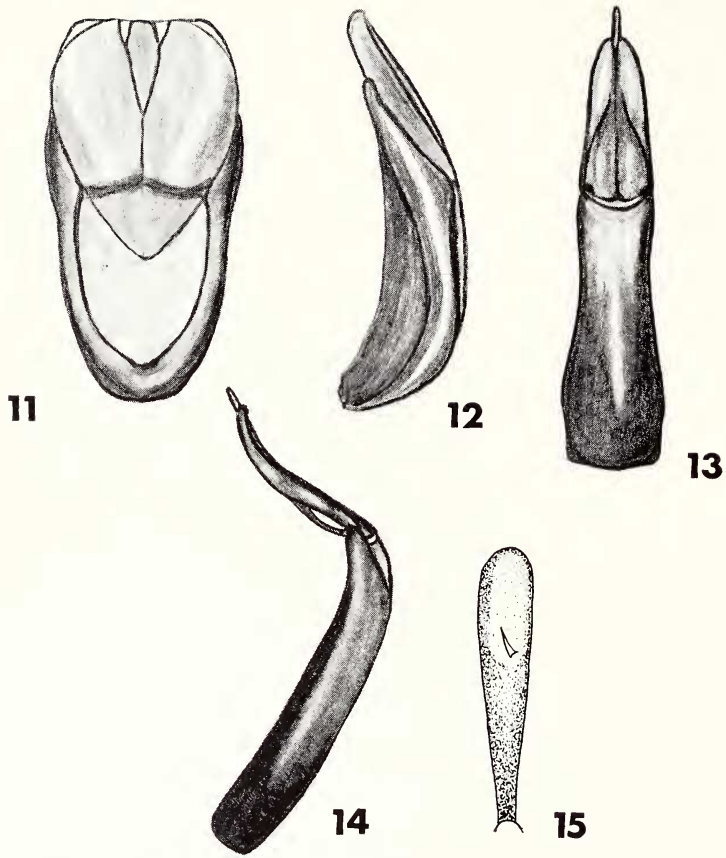
DIAGNOSIS: The combination of the strong micropunctation of the head and pronotum and the strong grooving of the elytral apex is unique among the known species. The elytral apex is pale, and the elytral length is generally 1.3 to 1.5 mm. This is the only species known north of Mexico in which the protibiae of the males lack secondary sexual modifications.

DISTRIBUTION: Central California, Fresno, Madera and Tulare counties.

HOLOTYPE: Male, Kings River, Route 180, Fresno County, California, August 23, 1950, P. S. Bartholomew (CA). Shape broadly oval and somewhat convex. Dorsal surface with head and pronotum black except sides of pronotum diffusely paler, both strongly micropunctate but without larger punctures; elytra black with sharply defined brownish yellow area at apex and extending about two thirds of the way anteriorly along sides, punctation of moderate strength, confused on disc but subserial laterally, apex strongly longitudinally grooved, no vestiture apparent, right elytron missing. Ventral surface blackish brown, antennae and palpi paler. Legs lacking sexual modifications or long spines. Aedeagus in dorsal view broad and flat, parameres broad, truncate, nearly rectangular; penis fairly slender, visible between parameres at tip; basal piece broad and short, approximately rectangular; in lateral view basal piece rather short and thick, extending as a shelf beneath most of paramere, including shelf about twice as long as paramere; paramere roughly triangular, dorsal margin slanting downward toward apex. EL 1.44 mm., GW 1.12 mm., GH .74 mm., GW/EL .78, GH/EL .51, PL .32 mm.

ALLOTYPE: Female, Kaweah, Tulare County, California, 1000 feet, no date, R. Hopping (CA). Externally identical to holotype, including legs, except punctation less regular at sides. EL 1.51 mm., GW 1.23 mm., GH .88 mm., GW/EL .80, GH/EL .58.

VARIATION: One paratype from Kings River, Fresno County



FIGS. 11–15. Fig. 11. *Chaetarthria truncata*, aedeagus, dorsal. Fig. 12. same, lateral. Fig. 13. *C. nigrella*, aedeagus, dorsal. Fig. 14. same, lateral. Fig. 15. protibia, medial face.

has a reddish brown pronotum and elytra, as compared with the black of the other specimens.

PARATYPES (total 10♂♂): UNITED STATES: *California*: FRESNO CO.: 2♂♂, data as holotype (CA, DM). MADERA CO.: 8♂♂, North Fork of San Joaquin River, at Sheep Crossing, 6000′, August 22, 1971, Hugh B. Leech (CA, DM).

THE NIGRELLA GROUP

DIAGNOSIS: Dorsal surface dark brown, sometimes with pale border on pronotum and elytra, head black; protibiae of males el-

bowed on inner margin and with single large, flat spine on medial surface of apical portion (fig. 15); male metasternum without larger bristles; parameres about twice as long as their combined width (fig. 13).

The single species which belongs to this group occurs throughout much of the western United States and into Canada. The sexual dimorphism of the protibiae, those of the male being elbowed, probably represents an advance over the previous group but *nigrella* lacks the further refinement of plates or discs on the male protibiae found in all the remaining groups.

Chaetarthria nigrella (LeConte)

(Figures 13, 14, 15, 16)

Cyllidium nigrellum LeConte, 1861, p. 342. Type locality: San Diego, California. Type male in Museum of Comparative Zoology, Harvard University (Lectotype, designated by Miller, McCorkle and Hatch, 1965, p. 46). Type reexamined by me for this study.

Chaetarthria nigrella: Horn, 1873, p. 125. Fall, 1901, pp. 12, 216. Leech and Chandler, 1956, p. 343. Miller, McCorkle and Hatch, 1965, p. 46.

DIAGNOSIS: Males may be recognized by either the aedeagus or the protibiae but the single large spine on the medial face of the protibia is not always easily seen so a male might be mistaken for a female. Females are similar to those of several other species but *nigrella* has the pronotum lightly micropunctate between the major punctures, while other species which may be confused with it are either strongly micropunctate (*truncata*) or lack micropunctation entirely (*punctulata*, *hespera*). Specimens of *nigrella* with a distinct pale border on the pronotum and elytra resemble *truncata* and *bicolor* in color pattern but both of these species have the elytral apex strongly grooved (at least in specimens with this color pattern) while *nigrella* does not. Size is also of some value in separating some specimens; elytral length measurements for the species noted above generally fall within the following ranges: *nigrella* 1.4 to 1.6 mm., *bicolor* 1.3 to 1.5 mm., *truncata* 1.3 to 1.5 mm., *hespera* 1.5 to 1.7 mm., *punctulata* 1.3 to 1.5 mm.

DISTRIBUTION: Western North America from southern British Columbia south to United States—Mexican border and east to central Montana and western Wyoming, in southern California apparently not extending east into or beyond the Mojave Desert.

MALE [based on lectotype, from California (MCZ)]: Shape oval, fairly convex. Head black, sparsely and very shallowly punctate,

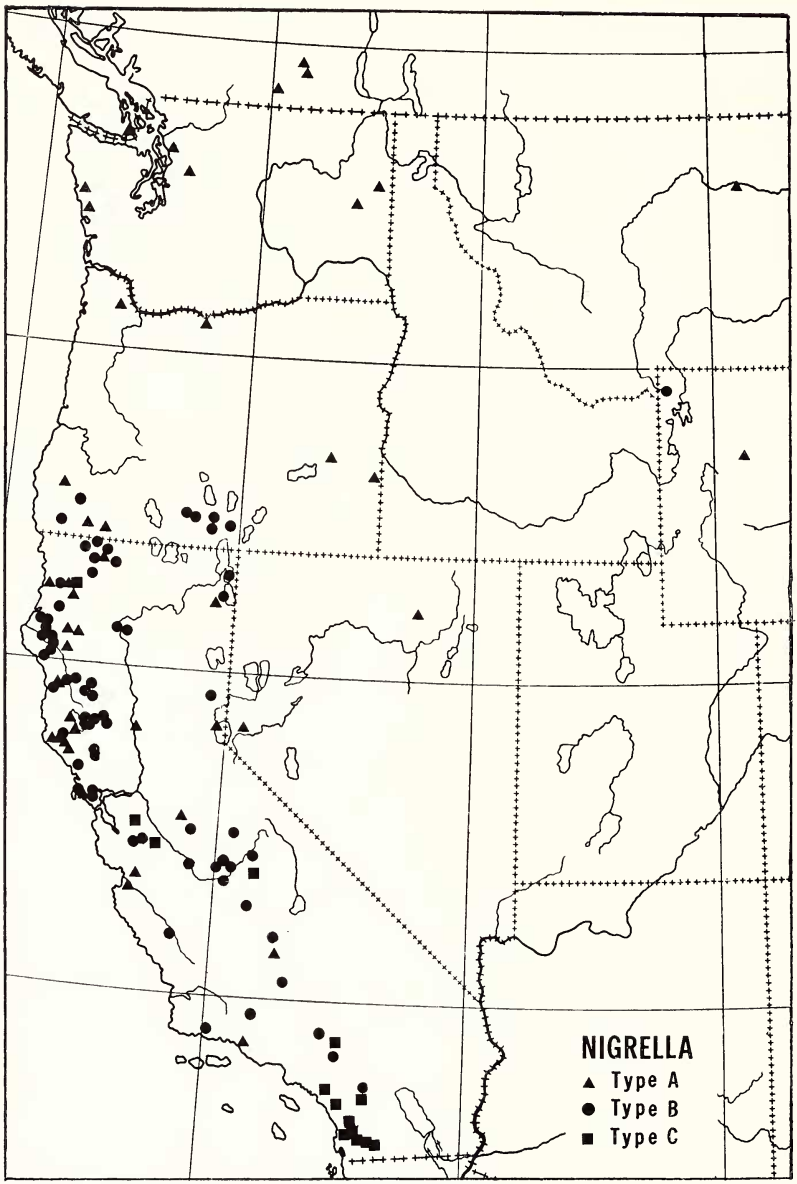


FIG. 16. Distribution of *Chaetarthria nigrella*. Type A, elytra without a definite pale border. Type B, pale border of elytra fairly broad but not sharply defined. Type C, pale border of elytra broad and sharply defined.

with only a few very fine hairs, labrum rather thickly but very finely punctate. Pronotum, scutellum and elytra entirely dark reddish brown except shading to yellowish brown at sides of pronotum and elytral apex, pronotum sparsely and very shallowly punctate with a few scattered, very fine hairs, lightly micropunctate between the major punctures in some areas, elytra fairly thickly but very shallowly punctate, punctures in alternate irregular and vaguely regular rows, irregular rows with a fine hair in each puncture. Ventral surface black, legs, palpi and antennae reddish brown. Protibiae widening sharply from base for about three-fifths of length, then very gradually narrowing to apex, about four times as long as greatest width, medial face of apical portion lacking plates or discs but with fairly large spine near the angle. Aedeagus in dorsal view with parameres sinuately convergent from base to tip, tip bluntly rounded; penis filiform; basal piece widening just back of juncture with parameres, then roughly parallel sided; in lateral view basal piece curved, about twice length of paramere; paramere slightly scoop-shaped near tip.

FEMALE [based on specimen from Pope Creek at Walter Springs road, Napa County, California, 520′, August 24, 1964, Hugh B. Leech (DM)]: Externally like male except palpi yellowish, legs and antennae lighter reddish brown, and lacking secondary sexual modifications of protibiae.

VARIATION: The micropunctation of the head and pronotum ranges from moderately strong (never as strong as in *truncata*) to very weak or even very rarely absent. Dorsal, ventral and appendage coloration vary from black to reddish brown, to yellow in the palpi.

Specimens from the mountains of Oregon and California usually have a poorly to sharply defined pale border that is narrow along the sides of the pronotum and the anterior quarter of the elytra and then broadening so that a wide portion of the elytral apex is pale. This border is most sharply defined in specimens from extreme southern California (San Diego, Riverside and Orange counties). See map, figure 16.

SPECIMENS EXAMINED: 252 males, 263 females. CANADA: *British Columbia*: Salmon Arm, banks of Shuswap River, October. Summerland, May, November. Vernon, August. Victoria. UNITED STATES: *California*: ALAMEDA CO.: May. CALAVERAS CO.: Mokel Hill, July. COLUSA CO.: Bartlett Springs road, Bear Valley, Bear Creek, April. 1.5 mi. SW. of Lodoga on road to Cooks Springs, Indian Creek, April. 4 mi. SW. Lodoga, Indian Creek, Cooks Springs, 1480′, July. South Fork Stony Creek, 1800′, May. FRESNO CO.: 5 mi. NE. Academy, route 168, 670′, September (muddy edge

of drying stock pond). Kings River, Route 180, August. Kings River Camp, August. GLENN CO.: Logan Basin, Estella Creek, 16.25 mi. W. of Elk Creek, 3450′, August. 0.5 mi. W. of Newville, North Fork Stony Creek, April. 7 mi. N. of Stonyford, tributary to Stony Creek, March. HUMBOLDT CO.: Alderpoint-Blocksburg road, South Dobbyn Creek, 450′, July. Alderpoint-Bridgeville road, Larabee Creek, 1100′, July. First crossing E. of Bridgeville, South Fork Van Duzen River, July. 3 mi. S. Bridgeville, Burr Creek, 1200′, July. 10 mi. S. Bridgeville, Martin Creek, 1150′, July. 1.3 mi. W. of Dinsmore, Van Duzen River, July. Garberville-Alderpoint road, Frenchman Creek, July. Green Point Ranch, 1500′, June. Willow Creek at Willow Creek, July. Willow Creek just above its East Fork, 1500′, August. KERN CO.: Havilah, April. LAKE CO.: Bartlett Springs, Bartlett Creek, August. 1.7 mi. W. Kelseyville, Kelsey Creek at Gross Ford, October. 2.75 mi. S. of Lower Blue Lake, Scott Creek, August. 0.5 mi. N. Upper Lake, Middle Creek, August. LASSEN CO.: Eagle Lake, July. Madeline, July. LOS ANGELES CO.: Littlerock, Mojave Desert. San Gabriel River, W. Fork Station, 3100′, July, August. MADERA CO.: Bates Station, March. Clover Meadow-North Fork road, West Fork Chiquito Creek, 4450′, August. 4.75 mi. ESE. Fish Camp, Big Creek at Boggy Meadow, 6400′, August. North Fork, May. MARIN CO.: Fairfax, April, August. Lagunitas, June. Novato, October (black light). Tocaloma, Lagunitas Creek, May. MENDOCINO CO.: Beebe Creek, September. Black Butte River just above mouth, July. 1 mi. E. of Cold Creek, East Fork Russian River, October. Covelo-Paskenta road, Williams Creek, July, August, October. Dry Creek, highway 128, September. Middle Fork Eel River, 0.3 mi. below mouth of Black Butte River, 1500′, July. Longvale-Covelo road, 7 mi. E. route 101, Bloody Run Creek, 1100′, July. Longvale-Dos Rios road, Outlet Creek, August. W. of Mailliard Redwoods State Park, Mill Creek, September. Twin Rocks, July. 2 mi. S. of Yorkville, Rancheria Creek, July. MERCED CO.: Merced, May. MODOC CO.: 9.5 mi. S. of Cedarville, Cottonwood Creek, 4950′, August. MONO CO.: Stone Creek, April. MONTEREY CO.: Lewis Creek, August. Marina, September. NAPA CO.: 4 mi. N. of Lake Berryessa, Eticuera Creek, August. Pope Creek at Walter Springs Road, 520′, July. NEVADA CO.: Truckee, 5800′, August. ORANGE CO. PLUMAS CO.: Clio, Middle Fork Feather River, August. RIVERSIDE CO.: Idlewild, July. San Jacinto Mountains. SAN BENITO CO.: San Benito River, June. SAN BERNARDINO CO.: Hesperia, June. Miller Canyon Public Campground, July. SAN DIEGO CO.: Cleveland National Forest, Pine Valley Creek, 4800′, July. Descanso, June,

September. El Monte Oaks, June. Mission Dam, September. Pamo Valley, April. San Mateo Canyon, October (under willows near stream bed). San Vincente Valley, April, June. SAN MATEO CO. SANTA BARBARA CO.: Santa Barbara. Santa Inez Mountains. SANTA CLARA CO.: Gilroy. Mt. Hamilton, August. SHASTA CO.: Redding, June. SISKIYOU CO.: 2.3 mi. NW. of Callahan, Sugar Creek, August. 1.5 mi. NE. of Cecilville, South Fork Salmon River, July. Cole, July. 3 mi. S. Fort Jones, June. 1.3 mi. E. of Grenada, Shasta River, August. 10 mi. W. of Montague, July (along creek). 5 mi. S. of Mt. Hebron, Butte Creek, September. 0.7 mi. W. of Seiad, Klamath River, August. Somes Bar-Callahan road, Nordheimer Creek 3.7 mi. NW. of Forks of Salmon, July. SONOMA CO.: Creek by highway 128 NW. of Cloverdale, October. Camp Meeker. Skaggs Springs, Warner Springs Creek, September. STANISLAUS CO.: Del Puerto Creek 4 mi. W. of route 5, September. 22 mi. W. of Patterson, Adobe Creek, April. SUTTER CO.: Lomo, May. TRINITY CO.: 3.3 mi. SW. of Denny, Panther Creek, 1300′, August. 7 mi. E. of Hayfork, Summit Creek, route 3, 2700′, August. Hayfork-Wildwood road, Hayfork Creek, August. Hyampom, Kerlin Creek, Big Slide road, July. 0.5 mi. E. of Hyampom, Hayfork Creek, July. 4.25 mi. SE. of Ruth, Mad River just above mouth of Van Horn Creek, Mad River, August. TULARE CO.: Gray Meadow, July. 9.5 mi. N. of Kernville, Kern River, March. Lower Kaweah River, August. TUOLUMNE CO.: Sonora. VENTURA CO.: Fillmore, March. Tejon Pass, July. *Montana*: BLAINE CO.: Bear Paw Mountains. *Nevada*: ELKO CO.: Elko. STOREY CO.: Virginia City, Six Mile Canyon, June. *Oregon*: DOUGLAS CO.: Roseburg, May (black light). 2 mi. E. Tiller, Tilson Creek, May. HARNEY CO.: N. of Burns, Poison Creek, June. JACKSON CO.: 3 mi. W. Dead Indian Soda Spring, May (under rocks on stream bank). Medford, July. JOSEPHINE CO.: Selma, May. KLAMATH CO.: 3 mi. SE. of Bly, Pole Creek, April. 7 mi. NW. of Bly, Meryl Creek, June. 10 mi. NE. of Bly, Deming Creek, June. 15 mi. NW. of Bly, (edge of creek). LAKE CO.: Crooked Creek, June. MALHEUR CO.: Sucker Creek at highway 95, July. WASCO CO.: The Dalles. WASHINGTON CO.: Banks, August. *Washington*: GRAYS HARBOR CO.: Humptulips, August. JEFFERSON CO.: Olympic National Park, Queets Ranger Station, May. KING CO.: South Fork Skykomish River, July. LINCOLN CO.: Sprague Lake, July. SNOHOMISH CO.: Cicero, North Fork Stilaguamish River, August. SPOKANE CO.: Spokane. *Wyoming*: FREMONT CO.: 10 mi. NW. of Burris, East Fork Wind River, August. YELLOWSTONE NATIONAL PARK: July. Near White Dome Geyser, August.

THE ATRA GROUP

DIAGNOSIS: Dorsal surface yellow to blackish brown, pronotum and elytra sometimes with pale border, head black; protibiae of males elbowed on inner margin (fig. 19, etc.) and with series of flat, slanting plates on medial surface of apical portion (fig. 20, etc.); male metasternum without larger bristles; parameres, taken together, slightly to much longer than broad (fig. 17, etc.).

This group of seventeen species occurs throughout the New World. Within the group there appear to be two nuclei of closely related species. Five species, *atra*, *atroides*, *hespera*, *spinata*, and *leechi*, are dark colored dorsally and are from North America, and most of them have the parameres roughly parallel sided. *C. pusilla* is similar but smaller and with the parameres much reduced. Eight species, *pamphila*, *hermani*, *argentina*, *pamphiloides*, *panda*, *malkini*, *goldbachi*, and *bruchi* are dorsally light yellow to dark brown, except for the black head, and are from South America. Most of these latter species also have a semimembranous area on the dorsum of each paramere. *C. pallida* is similar but is from North America. Relationships of those species not mentioned above are uncertain. See further discussion in the phylogeny section.

Chaetarthria atra (LeConte)

(Figures 17, 18, 19, 20, 24)

Cyllidium atrum LeConte, 1863, p. 24. Type locality: New York. Type male in Museum of Comparative Zoology (Harvard University), and examined by me for this study.

Chaetarthria atra: Horn, 1873, p. 125. Fall, 1901, pp. 12, 216. Richmond, 1920, p. 51. Wooldridge, 1967, p. 430. Malcolm, 1971, p. 36.

Chaetarthria nigrella: Wickham, 1895, p. 185 (not LeConte) (misidentification). Wickham cites this species from Ontario and/or Quebec, where *atra* is the only dark species known; *nigrella* is from western North America.

DIAGNOSIS: This is the only dorsally dark colored species of the genus found in the eastern half of the United States and adjacent Canada. *C. hespera* and *atroides* approach the western limits of *atra* but do not appear to be sympatric with it, and they differ from it in both the male protibiae and the aedeagus. Also *atroides* has sharply defined pale elytral and pronotal margins and is somewhat attenuate posteriorly, characters which *atra* lacks. The elytral length is generally 1.6 to 1.8 mm. for *atra*.

DISTRIBUTION: Southern Quebec and Nova Scotia south to Maryland and West Virginia and west to Missouri and Iowa; females col-

lected without males in Kansas, Michigan and Nebraska probably belong to this species also.

MALE [based on holotype, locality label a pink disc (MCZ)]: Shape oval, fairly convex. Head black, punctation sparse and shallow, no micropunctation between major punctures, vestiture very light. Pronotum, scutellum and elytra reddish brown, pronotum laterally and elytra apically slightly paler, pronotum nearly impunctate and glabrous, no micropunctation between major punctures. Elytral punctures larger, in discal area in alternate irregular and somewhat regular rows, those of irregular rows bearing fine hairs, elytral apex lacking grooves or raised areas, sutural striae traceable nearly two thirds of way from apex to base. Ventral surface very dark reddish brown except prosternum, legs and abdomen pale reddish brown and palpi and antennae yellowish. Protibiae in anterior view widening sharply from base for about one-fourth of length, then very gradually narrowing toward apex, about four times as long as greatest width, inner face of apical portion with series of flat, slanting plates close together, most extending slightly beyond posterior margin of tibiae, eleven plates on each protibia. Aedeagus in dorsal view with the parameres elongate, nearly parallel sided, together drawn out to point at middle of tip, paramere sides weakly sclerotized in about apical third; apical portion of penis slender, barely visible between paramere tips; basal piece long, narrowing towards juncture with parameres; in lateral view basal piece slightly concave ventrally, about twice as long as parameres; ventral sclerotized portion of paramere sharply bowed near middle, dorsal portion slightly concave.

FEMALE [based on specimen from Ripley Co., Missouri, Buffalo Creek at Route C, 5.5 mi. N. of Briar, August 5, 1967, Hugh B. Leech (CA)]: Externally like male except lacking secondary sexual modifications of protibiae.

VARIATION: Pronotal and elytral coloration vary from light brown to nearly black, and generally are somewhat reddish. The elytral and pronotal borders may be from much paler to not at all paler than the discs, with the contrast usually greater in darker specimens. Two females from Washtenaw County, Michigan (UW) are somewhat shorter but more robust than usual, and since they were taken without accompanying males they could possibly represent another species.

SPECIMENS EXAMINED: 40 males, 42 females. CANADA: *Nova Scotia*: COLCHESTER CO.: Portaupique, July. *Quebec*: BROME CO.: Brome, June. Potton Springs (♀ only). UNITED STATES: *Arkansas*: BOONE CO.: Alpena, June (at light) (♀ only). RANDOLPH CO.: 4 mi. N. of Pocahontas, August (stream). *Illinois*: CHAMPAIGN CO.: Mahomet, Nettie Hart Woodland, July (black light) (♀ only). JACK-

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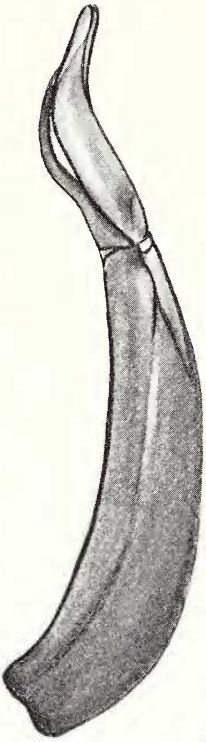

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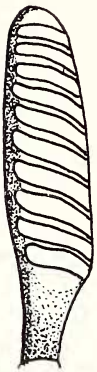

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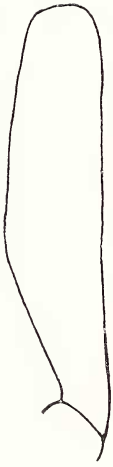

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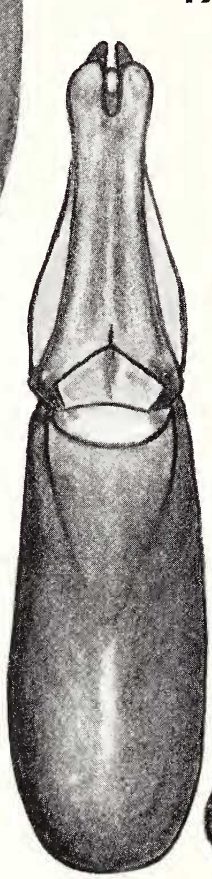

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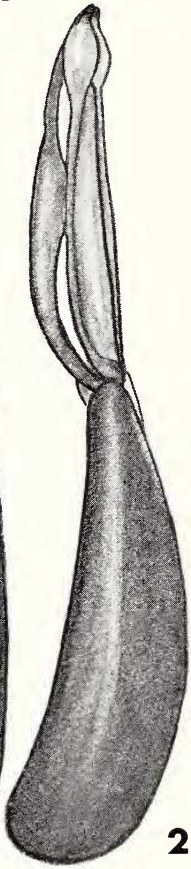

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SON CO.: Giant City State Park, July. *Iowa*: BUCHANAN CO.: Backbone State Park, near Strawberry Point, August. *Kansas*: Republican River (♀ only). *Maine*: OXFORD CO.: Paris, Stony Brook, June. *Maryland*: MONTGOMERY CO.: Plummers Island, April. *Michigan*: WASHTENAW CO.: August (♀ only). *Missouri*: BARRY CO.: Roaring River State Park, June. BOONE CO.: 5 mi. S. Columbia, April. BUTLER CO.: 12 mi. SE. of Ellsinore, stream at Highway 60, August. CRAWFORD CO.: Meramec River, State Highway 8, July. 8 mi. W. Steelville, Meramec River, October (♀ only). DALLAS CO.: Bennet Springs, August. HOWELL CO.: Willow Springs, June. MCDONALD CO.: 3 mi. N. Noel, Elk River, Highway 59, August. REYNOLDS CO.: Ellington, Logan Creek, August (♀ only). RIPLEY CO.: 5.5 mi. N. of Briar, stream at Route C, August. 5.5 mi. N. of Briar, Buffalo Creek at Route C, July. *Nebraska*: THOMAS CO.: 2.5 mi. W. of Halsey, Nebraska National Forest, July (♀ only). *New Hampshire*: STRAFFORD CO.: Farmington, August (♀ only). *New York*: CHAUTAQUA CO.: Chautauqua ? ("Chaut."). TOMPKINS CO.: Ithaca, May. ULSTER CO.: Phoenicia, July. *Tennessee*: DAVIDSON CO.: Nashville, August. *West Virginia*: GREENBRIAR CO.: White Sulphur (Springs ?). Females taken without males are only tentatively identified.

Chaetarthria atroides, new species
(Figures 21, 22, 23, 24)

DIAGNOSIS: This species is generally recognizable by the sharply defined pale sides and elytral apex, as other species sympatric with it are usually only vaguely paler in those areas (see map). However some specimens of other dorsally dark species may approach *atroides* in the sharpness of the pale border, particularly darker specimens. The elytral length of *atroides* is generally 1.7 to 2.0 mm., while *atra*, which appears to be nearly but not quite sympatric with it, and *hespera*, which is sympatric, are generally under 1.8 mm. *C. magna*, which is also apparently not quite sympatric with *atroides*, is generally over 1.8 mm. Males of *atroides* may be recognized by the slight attenuation of the posterior of the body, by the protibiae with seven or eight plates on the medial face of the apical portion, and by the aedeagus.

←

FIGS. 17–23. Fig. 17. *Chaetarthria atra*, aedeagus, dorsal. Fig. 18. same, lateral. Fig. 19. same, left protibia, anterior face. Fig. 20. same, medial face. Fig. 21. *C. atroides*, left protibia, anterior face. Fig. 22. same, aedeagus, dorsal. Fig. 23. same, lateral.

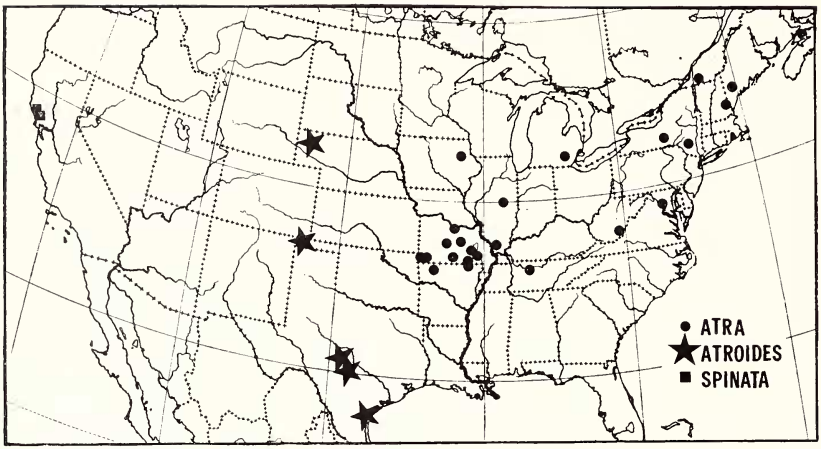


FIG. 24. Distribution of *Chaetarthria atra*, *C. atroides* and *C. spinata*.

DISTRIBUTION: Central Texas to Nebraska.

HOLOTYPE: Male, 16 mi. S. of Brady, on San Saba River, McCulloch Co., Texas, June 13, 1963, D. C. and K. A. Rentz (CA). Shape oval, fairly convex, elytra somewhat attenuate posteriorly. Head black, punctation sparse and shallow except labrum with many fine punctures, no micropunctation between major punctures, with only a few scattered, very fine hairs. Pronotum, scutellum and elytra dark reddish brown, sharply paler at sides of pronotum and elytra and in about apical quarter of elytra, pronotum nearly devoid of punctation and vestiture, lacking micropunctation, elytral punctation moderately coarse and thick, in alternate irregular and somewhat regular rows, punctures of irregular rows bearing fine hairs, elytral apex lacking grooves or raised areas, sutural striae traceable for about two thirds of distance from apex to base. Ventral surface black except legs and prosternum reddish brown, palpi and antennae yellowish brown. Protibiae in anterior view widening fairly sharply from base for slightly less than half of length, then gradually narrowing to apex, about four times as long as greatest width, inner face of apical portion with a series of flat, slanting plates fairly close together, most extending slightly beyond posterior margin of tibia, seven on right protibia, eight on left. Aedeagus in dorsal view with parameres parallel sided in about basal two fifths, then gradually narrowing to apex except somewhat bulbous at tip, side portions at tip weakly sclerotized, each paramere with tooth on inner margin of tip; tip of penis barely visible, not extending to tip of parameres; basal piece long, widest near an-

terior end; in lateral view basal piece slightly longer than parameres; dorsal sclerotized portion of paramere nearly straight except humped at tip, ventral sclerotized portion gently curved near base and broader just beyond middle of its length. EL 1.84 mm., GW 1.45 mm., GH .96 mm., GW/EL .79, GH/EL .52, PL .40 mm.

ALLOTYPE: Female, same data as holotype (CA). Externally like holotype except much less attenuate posteriorly and lacking secondary sexual modifications of protibiae. EL 1.93 mm., GW 1.54 mm., GH .96 mm., GW/EL .80, GH/EL .50.

VARIATION: No appreciable variation noted except that females differ consistently from males in being much less attenuate posteriorly.

PARATYPES (7 ♂♂, 8 ♀♀): UNITED STATES: *Nebraska*: SHERIDAN CO.: 14 mi. S. Hay Springs, Niobrara River, 1 ♂, 1 ♀, September 5, 1970, Lee Herman (AMNH). *Oklahoma*: CIMARRON CO.: 25 mi. NW. of Boise City, Black Mesa, at south end Lake Carl Etling, 1 ♂, 1 ♀, August 14, 1967, Hugh B. Leech (CA). *Texas*: GILLESPIE CO.: Lange's Mill, 4 ♂♂, 5 ♀♀, June 5, 1969, Board and Hafernik (DM, TAM). SAN PATRICIO CO.: Welder Wildlife Refuge, 1 ♂, 1 ♀, June 28, 1969, Board and Hafernik (TAM).

Chaetarthria hespera, new species
(Figures 25, 26, 27, 28, 33)

DIAGNOSIS: This species is largely sympatric with *C. nigrella* from which it differs in larger average size (elytral length of *nigrella* generally 1.4 to 1.6 mm., of *hespera* generally 1.5 to 1.7 mm.) and in having the pronotum without micropunctation between the larger punctures. Also *hespera* tends to be more reddish and *nigrella* more blackish dorsally, and although *hespera* occasionally has the sides and apex of the elytra with a fairly sharply defined pale border it is never as sharply defined as in southern California populations of *nigrella*. See also *C. spinata*, *magna* and *punctulata*, which are dorsally dark and at least partially sympatric or nearly sympatric with *hespera*.

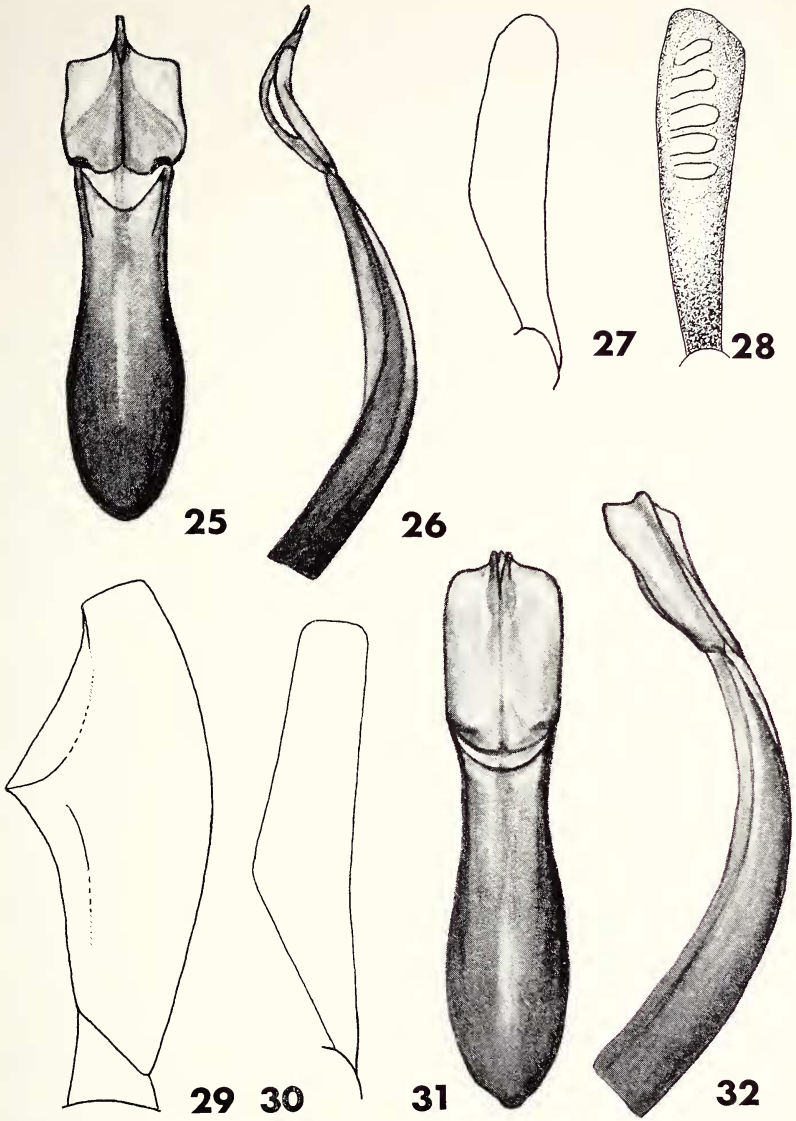
DISTRIBUTION: Southwestern United States north to San Francisco Bay area and east to central Oklahoma. The species undoubtedly also extends into Mexico, but no specimens are known from there.

HOLOTYPE: Male, South West Research Station, 5 mi. W. of Portal, Cochise Co., Arizona, 5400′, July 25, 1956, E. Ordway (AMNH). Shape oval, fairly convex. Head black, shallowly but fairly thickly punctate, no micropunctation between major punctures, nearly glabrous, labrum with many fine punctures. Pronotum, scutellum and elytra reddish brown, pronotum narrowly yellowish at sides

and inward along front and back margins, apical portion of elytra slightly paler than disc, pronotum finely and sparsely punctate, no micropunctation between major punctures, nearly glabrous, elytral punctures larger, in alternate irregular and vaguely regular series, those of irregular series bearing fine hairs, elytral apex lacking grooves or raised areas, sutural striae traceable nearly three quarters of way from apex to base. Ventral surface black except legs, palpi, antennae, prosternum and part of sides of third and fourth abdominal sternites yellowish brown. Protibiae in anterior view widening sharply from base for about half of length, then very gradually narrowing toward apex, about four times as long as greatest width, inner face of apical portion with series of flat, slanting plates close together, five on each protibia. Aedeagus in dorsal view with parameres broad and flat, together forming nearly a square, each paramere with inner apical corner attenuate; penis tip not visible (although visible between paramere apices in some other specimens, and slender); basal piece long, parallel sided, narrower just before junction with parameres; in lateral view basal piece curved, concave ventrally, if straightened out would be nearly three times length of parameres; ventral sclerotized portion of parameres bent nearly at right angle near middle so apical half points nearly dorsally. EL 1.66 mm., GW 1.37 mm., GH .84 mm., GW/EL .82, GH/EL .51, PL .16 mm.

FEMALE [based on specimen with same data as holotype (AMNH); no allotype designated]: Externally like holotype except lacking secondary sexual modifications of protibiae.

VARIATION: Specimens from the extreme eastern parts of the range tend to have darker dorsal color, sometimes with indications of a pale elytral border. They also average greater in paramere length and often have more than five plates on the male protibiae (five being the number for nearly all California specimens), up to seven in some males from Texas. Since these localities are east of the range of *C. nigrella* it at first seemed that this might be a case of character displacement, with *hespera* being less blackish than *nigrella* where they are sympatric; however 33 *hespera* from 7 miles south of Walnut Creek, Contra Costa County, California are nearly all quite blackish and this is well within the geographical range of *nigrella*. All of the localities where *hespera* is known to be rather blackish are, however, on the periphery of the range of that species, and it has been observed a number of times that peripheral populations of organisms tend to be more variable and to have more extreme characters than central populations. In addition to the Walnut Creek locality noted above the other most northerly localities, Sunol (Alameda County, Cali-



FIGS. 25–32. Fig. 25. *Chaetarthria hespera*, aedeagus, dorsal. Fig. 26. same, lateral. Fig. 27. same, left protibia, anterior face. Fig. 28. same, medial face. Fig. 29. *C. spinata*, left mesofemur, anterior face. Fig. 30. same, left protibia, anterior face. Fig. 31. same, aedeagus, dorsal. Fig. 32. same, lateral.

fornia) and Lagunitas (Marin County, California) are represented by single males which are slightly darker than average for the species.

PARATYPES AND FEMALES (total 275 ♂♂, paratypes, 331 ♀♀, not paratypes): UNITED STATES: *Arizona*: No further data, 2 ♂♂, 1 ♀ (AMNH, PAS). COCHISE CO.: Ash Canyon, 1 ♂, 1 ♀, July 25, 1968, D. E. Bright (CNC). Bear Canyon, Huachuca Mountains, 1 ♂, May 8, 1953, A. and H. Dietrich (CU). Charleston Crossing, San Pedro River, 1 ♂, 1 ♀, April 15, 1969, D. and J. Schuh (JS). Guadelupe Canyon, 4200′, 2 ♂♂, 2 ♀♀, June 11, 1968, Vincent D. Roth (SWRS). Guadelupe Canyon, Guadelupe Mountains, 44 ♂♂, 50 ♀♀, June 10–11, 1968, Menke and Flint (DM, USNM). 10 mi. E. McNeal, Swisshelm Mountains, 3 ♂♂, 2 ♀♀, April 15, 1969, D. and J. Schuh (JS). 5 mi. W. Portal, South West Research Station, 5400′, 10 ♂♂, 14 ♀♀, same data as holotype (AMNH, DM), 1 ♂, 3 ♀♀, July 15, 1967 (SWRS), 1 ♂, August 4, 1957, C. P. Alexander (JS). Sierra Vista, Huachuca Mountains, 1 ♂, May, 1965, R. F. Sternitzky (CNC). Texas Pass, Dragoon Mountains, 1 ♂, 1 ♀, July 21, 1917, C. U. Biol. Exped (CU). COCONINO CO.: Flagstaff, 2 ♂♂, 1 ♀, Dr. A. Fenyes (CA). Grand Canyon, Bright Angel Trail, 1 ♂, July 31, 1914, J. C. Bradley (CU). GILA CO.: Globe, 1 ♂, 1 ♀, July 6, 1935, Parker (CA). Globe, Pinal Creek, 1 ♂, 4000′, June 6, 1953, A. and H. Dietrich (CU). GREENLEE CO.: 21 mi. N. Clifton, 2 ♂♂, July 12, 1968, D. E. Bright (CNC). MARICOPA CO.: Cave Creek Canyon, Chiricahua Mountains, July (♀ only). PIMA CO.: Tucson, 2 ♂♂, 1 ♀ (USNM). 10 mi. NE. Tucson, Santa Catalina Mountains, 3000′, May (♀ only). PINAL CO.: Riverside, 3 ♂♂, 1 ♀ (CA, USNM). Superior, 1 ♂, 1 ♀, July 30, 1948, H. K. Gloyd (light) (INHS). Superior, Boyce Thompson Arboretum, 2 ♂♂, 2 ♀♀, July 12 and 15, 1949, B. W. Benson (light trap) (INHS). SANTA CRUZ CO.: No further locality, 1 ♂, August, K. Koebele (USNM). 2.5 mi. W. of Harshaw, Patagonia Mountains, 1 ♂, July 2, 1952, H. B. Leech and J. W. Green (CA). Madera Canyon, Santa Rita Mountains, 1 ♂, July 29, 1968, D. E. Bright (CNC). Nogales, 7 ♂♂, 5 ♀♀, August 16, 1940, F. W. Nunenmacher (CA, CNHM). Nogales, Mt. Washington, 6000′, July (♀ only). Patagonia, 3 ♂♂, 13 ♀♀, July 10, 1936, E. S. Ross (CA). Santa Rita Mountains, 1 ♂, 2 ♀♀, July 11, 1950, L. D. Beamer (KU). Yank's Spring, Sycamore Canyon, Tumacacori Mountains, 1 ♂, 3 ♀♀, August 3, 1952, Hugh B. Leech (CA). YAVAPAI CO.: Bumblebee, 1 ♂, 1 ♀, May 20, 1919, E. Schiffel, J. W. Green (CA). Prescott, 1 ♂, June 30, 1918 (CA). YUMA CO.: No further locality, 1 ♂, June (RBM). *California*: No further locality, 1 ♂ (CA), 1 ♂, June, 1897 (LAM), 1 ♂, 1 ♀, Horn (PAS).

ALAMEDA CO.: Berkeley, September (♀ only). Sunol, 1 ♂, September 14, 1919 (CA). CONTRA COSTA CO.: 7 mi. S. Walnut Creek, margins of Bollinger Creek, 19 ♂♂, 14 ♀♀, March 24, May 10 and May 17, 1968, L. Neil Bell (AMNH, CA, DM, LNB). KERN CO.: 3.5 mi. E. Caliente, Harper Canyon Creek, 1 ♂, March 26, 1970, Hugh B. Leech (CA). 4 mi. E. of Caliente, Caliente Creek, 8 ♂♂, 9 ♀♀, March 26, 1970, Hugh B. Leech (CA, DM). 0.5 mi. N. of Havilah, Havilah Creek, 4 ♂♂, 10 ♀♀, March 25, 1970, Hugh B. Leech (CA). Lebec, 2 ♂♂, 2 ♀♀, May 12, 1916, J. O. Martin (CA). Tejon Pass, 1 ♂, July 28, 1918 (CA). Wofford Heights, 2300′, June (at light) (♀ only). LOS ANGELES CO.: No further data, 1 ♂ (USNM). Los Angeles (♀ only). Littlerock, Mojave Desert, 3 ♂♂, 2 ♀♀ (CA). Mt. Wilson (♀ only). Pasadena, 6 ♂♂, 5 ♀♀, J. O. Martin (CA), 1 ♂, 1 ♀, February (CA), 1 ♂, February, Dr. A. Fenyes (CU), 3 ♂♂, Dr. A. Fenyes (CNHM, MCZ), 1 ♂, October 10, 1897 (MCZ). Rincon, San Gabriel River, Station 1800′, 22 ♂♂, 18 ♀♀, September 26, 1970, P. D. Perkins (PP). San Fernando, 1 ♂, 2 ♀♀, April 1, 1920, F. Winters (CA). San Gabriel River, West Fork, Station 3100′, 17 ♂♂, 18 ♀♀, July 10 and August 1, 1970, P. D. Perkins (PP). Tujunga Canyon, May (♀ only). MARIN CO.: Lagunitas, 1 ♂, May 11, 1942, H. P. Chandler (CA). MONTEREY CO.: Carmel, July (♀ only). Lewis Creek, 1 ♂, August 29, 1952, Hugh B. Leech (CA). ORANGE CO.: No further data (♀ only). Santa Catalina, 1 ♂, 1 ♀, H. C. Fall (MCZ). RIVERSIDE CO.: Dripping Springs Camp, Arroyo Seco Creek, Cleveland National Forest, 1 ♂, 1 ♀, July 8, 1969, B. S. Cheary (DM). Garner Valley E. of Lake Hemet, 12 ♂♂, 10 ♀♀, April 16, 1971, I. M. Newell (BC, DM). Idyllwild ("Idlewild"), 6 ♂♂, 8 ♀♀, July 8, 1928 (CA, DM). 4 mi. S. Palm Desert, P. L. Boyd Desert Research Center, Deep Canyon, 1 ♂, July 24, 1969, S. Frommer (DM). Riverside, 1 ♂, 1 ♀ (CA). San Jacinto Mountains, 6 ♂♂, 9 ♀♀ (CA). SAN BERNARDINO CO.: Arrowhead, May (♀ only). Miller Canyon Public Campground, 2 ♂♂, 1 ♀, July 9, 1964, G. R. Noonan (UCR). SAN DIEGO CO.: Campo, 1 ♂, May 27, 1928 (CA). San Mateo Canyon, 4 ♂♂, 9 ♀♀, October 22, 1967, K. Cooper (Berlese, under willow) (BC, DM). San Vincente Valley, June (♀ only). SAN LUIS OBISPO CO.: 10 mi. W. of Clear Creek, Cuyama Canyon, March (by splashing water on sand) (♀ only). Santa Margarita, 1 ♂, June 25, 1916, J. O. Martin (CA). SAN MATEO CO.: La Honda (♀ only). SANTA CLARA CO.: 4 ♂♂, 1 ♀, Baker (AMNH, CM). SONOMA CO.: Geysers, 1 ♂, May 21, 1879 (INHS). VENTURA CO.: Filmore, 1 ♂, 1 ♀, March 21, 1923 (KU). *Colorado*: JEFFERSON

CO.: Deer Creek Canyon, July (♀ only). MOFFAT CO.: 2 mi. E. Maybell, Deception Creek, 5910′, 1 ♂, 1 ♀, July 13, 1967, H. B. Leech (CA). *New Mexico*: GRANT CO.: Silver City, 1 ♂, 1 ♀, July, 1913, J. B. Wallis (CNC), 1 ♂, July 22, 1936, J. D. Beamer (KU). LINCOLN CO.: 5 mi. N. Angus, Highway 37, 7050′, 1 ♂, August 7, 1965, Hugh B. Leech (CA). SANTA FE CO.: Santa Fe, 1 ♂, 3 ♀♀ (CNC), 1 ♂, 2 ♀♀, August, 1897 (CA). SIERRA CO.: 4 mi. E. of Hillsboro, Piedra River Gorge in Mimbres Mountains, 1 ♂, 1 ♀, August 31, 1952 (CNHM). *Oklahoma*: CADDO CO.: Hinton, June (♀ only). CIMARRON CO.: 25 mi. NW. of Boise City, at S. end Lake Carl Etling, Black Mesa State Park, 3 ♂♂, 12 ♀♀, August 14, 1967, Hugh B. Leech (CA, DM). 7 mi. E. of Kenton, N. Crease Creek, 2 ♂♂, 1 ♀, August 14, 1967, Hugh B. Leech (CA). *Texas*: BREWSTER CO.: 20 mi. S. of Alpine, 6 ♂♂, 5 ♀♀, May 12, 1927, J. O. Martin (CA). Panther Junction, Big Bend National Park, 4000′, 1 ♂, May 8, 1959, Howden and Becker (at light) (CNC). CULBERTSON CO.: 2½ mi. E. of Nickel Creek Station, 1 ♂, September 2, 1952, Borys Malkin (CNHM). JEFF DAVIS CO.: Fort Davis, 4 ♂♂, 4 ♀♀, May 30, 1959, Howden and Becker (at light) (CNC). Limpia Creek Canyon, Davis Mountains, 2 ♂♂, 2 ♀♀, September 4–5, 1952, Borys Malkin (CNHM). LLANO CO.: Enchanted Rock, April (♀ only). PRESIDIO CO.: Presidio, April (♀ only). *Utah*: WASHINGTON CO.: Chad's Ranch, 1 ♂, 1 ♀, July 22, Wickham (CA). County ?: Escalante River, mouth of Calf Creek (♀ only). *Wyoming*: LARAMIE CO.: 12.5 mi. NE. of Cheyenne, Lodgepole Creek at Highway 85, 1 ♂, 4 ♀♀, August 18, 1965, Hugh B. Leech (CA). PLATT CO.: 2 mi. S. of Glendo, Horseshoe Creek, 1 ♂, 3 ♀♀, July 29, 1964, Hugh B. Leech (CA). 5.8 mi. S. of Glendo, stream under Highway 87, July (♀ only). Females taken without males are only tentatively identified.

Chaetarthria spinata, new species
(Figures 24, 29, 30, 31, 32)

DIAGNOSIS: Males can be easily determined by the presence of a broad tooth on the hind margin of the mesofemora, as well as by the protibiae with ten to twelve plates and the aedeagus. Females might be confused with those of *C. nigrella* or *C. hespera*. However *spinata* is larger than *nigrella* (elytral length for *spinata* generally 1.7–2.1 mm., for *nigrella* 1.4–1.6 mm.), and averages much more lightly micropunctate between the major punctures on the pronotum, and appears to be slightly north of the range of *hespera*, which lacks

any micropunctation. See also *C. punctulata*, which is also western but apparently has a range which ends considerably south of that of *spinata*, and *C. leechi*, which is rather rare.

DISTRIBUTION: Sonoma and possibly Mendocino counties, California, near the Pacific Coast.

HOLOTYPE: Male, South Fork Gualala River, at bridge, N. road to Annapolis, Sonoma County, California, October 12, 1964, Hugh B. Leech (CA). Shape oval, fairly convex. Head black, punctation thick but fairly shallow, very lightly micropunctate between major punctures, labrum with many finer punctures. Pronotum, scutellum and elytra dark brown, pronotum and scutellum blackish, pronotum yellow laterally, elytra more reddish, lacking distinct pale areas, pronotum thickly but shallowly punctate, very lightly micropunctate between the major punctures, vestiture very sparse, elytra with larger punctures, in alternate irregular and vaguely regular series, those of the irregular series bearing fine hairs, elytral apex lacking grooves or raised areas, sutural striae traceable nearly three quarters of the way from apex to base. Ventral surface black except palpi, antennae, prosternum, legs, and areas at sides of third and fourth abdominal segments brown. Protibiae in anterior view widening sharply from base for about two fifths of length, then narrowing to apex, about four times as long as greatest width, inner face of apical portion with a series of flat, slanting plates very close together, ten on each protibia. Mesofemora with posterior margin extended to form a broad, definite tooth about one third of way from apex. Aedeagus in dorsal view with parameres flat and broad, together forming a rectangle nearly twice as long as broad, each paramere with inner corner attenuate; penis tip just visible between apices of parameres; basal piece long, nearly parallel sided, narrowed just before juncture with parameres; in lateral view basal piece curved, if straightened out would be about three times length of parameres; ventral sclerotized portion of parameres bowed ventrally at middle, forming scoop-like shape, dorsal sclerotized portion more or less flat. EL 1.73 mm., GW 1.51 mm., GH .88 mm., GW/EL .87, GH/EL .49, PL .23 mm.

ALLOTYPE: Female with same data as holotype (CA). Externally like male except lacking secondary sexual modifications of protibiae and mesofemora. EL 1.89 mm., GW 1.54 mm., GH .90 mm., GW/EL .81, GH/EL .48.

VARIATION: The micropunctation of the pronotum is extremely light and difficult to see in some specimens, somewhat more definite in others. The pale margin of the pronotum is usually rather

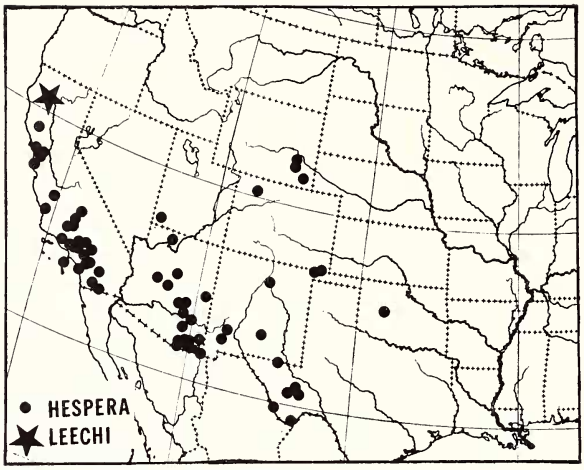


FIG. 33. Distribution of *Chaetarthria hespera* and *C. leechi*.

sharply defined, but the apex of the elytra is seldom any more than slightly paler than the disc.

PARATYPES AND FEMALES (total 14 ♂♂, paratypes, 47 ♀♀, not paratypes): UNITED STATES: *California*: MENDOCINO CO.: Garcia River at Highway 1, October (♀ only). 7 mi. E. of Route 101 on Longvale-Covelo Road, Bloody Run Creek, 1100′, July (♀ only). SONOMA CO.: 13 ♂♂, 34 ♀♀, locality as holotype, September 6, September 7 and October 12, 1964, Hugh B. Leech (CA, DM, USNM). 3 mi. S. of Cazadero, Austin Creek, 1 ♂, 10 ♀♀, April 15, 1950, Hugh B. Leech (CA). Guerneville, July (♀ only).

Chaetarthria leechi, new species
(Figures 33, 34)

DIAGNOSIS: The only other dark colored species known to be sympatric with *leechi* is *C. nigrella*, which is smaller (elytral length generally 1.4 to 1.6 mm. compared to 1.8 to 2.1 mm. for *leechi*) and usually has more evident micropunctation on the pronotum (the micropunctation of *leechi* males is extremely faint and absent on the only known female). *C. hespera* and *spinata* are close enough to be possibly sympatric, but the former is more reddish on the pronotum and elytra than *leechi* and the latter is slightly more robust, less parallel sided, and usually slightly more brownish than *leechi*. These differences are subtle enough in many specimens that determinations should not be considered definite without males.

This species is named in honor of Mr. Hugh B. Leech, of the California Academy of Sciences, San Francisco, because he collected all of the known specimens and also has collected great numbers of *Chaetarthria* for this study.

DISTRIBUTION: Trinity County, California.

HOLOTYPE: Male, Hayfork Creek at Hayfork-Wildwood Road, Trinity County, California, July 11, 1970, Hugh B. Leech (CA). Shape oval, rather parallel sided, fairly convex. Head black, punctation fairly coarse, extremely faintly micropunctate between the major punctures, labrum with many finer punctures, vestiture extremely fine and sparse. Pronotum, scutellum and elytra brownish black, diffusely paler at elytral apex sides of pronotum, pronotum with fairly sparse, fine punctation, extremely faintly micropunctate between the major punctures, vestiture sparse, elytral punctation much coarser, in alternate irregular and vaguely regular series, those of the irregular series bearing fine hairs, elytral apex lacking grooves or raised areas, sutural striae traceable for about two thirds of distance from apex to base. Ventral surface black except palpi, antennae, and legs from tip of femur outward dark reddish brown. Protibiae in anterior view widening sharply from base for about one third of length, then narrowing less sharply to apex, about three and one half times as long as greatest width, inner face of apical portion with series of flat, slanting plates very close together, nine on right protibia, eight on left. Aedeagus in dorsal view with parameres broad in basal two thirds, with bowed sides, apical third much narrower, tip pointed; filiform tip of penis visible between apices of parameres; basal piece elongate, narrower near juncture with parameres; in lateral view basal piece mostly hidden in abdomen of beetle (not fully dissected); entire paramere evenly bowed, forming a scoop shape. EL 1.75 mm., GW 1.54 mm., GH .88 mm., GW/EL .88, GH/EL .50, PL .39 mm.

FEMALE [based on specimen with same locality as holotype but collected on August 7, 1972, by Hugh B. Leech (CA); no allotype designated]: Externally like male except lacking secondary sexual modifications of protibiae and with no micropunctation between major punctures of head and pronotum.

VARIATION: The other specimens, although all taken at or near the type locality, are all appreciably larger than the holotype (elytral length over 2.0 mm.) and the males have more plates on the protibiae (nine or ten). Thus the holotype may be somewhat atypical. Since only one female is known it is not possible to state whether the

absence of micropunctation on the head and pronotum is a consistent sexual difference.

PARATYPES (total 2 ♂♂): UNITED STATES: *California*: TRINITY CO.: Locality as holotype but August 7, 1972, 1 ♂, Hugh B. Leech (DM). Hayfork Creek just S. of its East Fork, 2700′, 1 ♂, August 9, 1972, Hugh B. Leech (CA).

Chaetarthria pusilla Sharp
(Figures 35, 36, 37, 38, 39, 43)

Chaetarthria pusilla Sharp, 1882, p. 88. Type locality: Guatemala City, Guatemala. Male type plus male paratopotype in British Museum (Natural History). Type examined by Mr. Harry Kenward and paratopotype by me for this study.

Chaetarthria minor Fall, 1901, p. 216. **NEW SYNONYMY**. Type localities: Riverside and Pasadena, California. Male and female cotypes in United States National Museum, examined by me for this study. Schwarz, 1914, p. 165 (possibly misidentified). Leech and Chandler, 1956, p. 343.

DIAGNOSIS: Throughout most of its range, the small size of this species (elytral length generally 0.9 to 1.3 mm.) separates it from all other dark species except very small specimens of *punctulata*, but the members of the *glabra* group, from Mexico and Central America, are within the same size range. *C. glabra* is dorsally very smooth, much less clearly punctate than *pusilla*, and the other species of its group which are as small as *pusilla* tend to be a lighter, more reddish brown than *pusilla*. However females should not be considered as being certainly identified when not accompanied by males unless they are from north of central Mexico.

DISTRIBUTION: Mendocino County, California, east to south eastern Texas (Blanco County) and south to Costa Rica.

MALE [based on specimen from 5 mi. SE. of El Progreso, El Progreso, Guatemala, August 11, 1965, Paul J. Spangler (USNM); this is the specimen which is closest to the type locality and which is suitable for describing since the male paratopotype which I have seen is missing its aedeagus]: Shape oval, rather parallel sided at middle, not very convex. Head black, punctation shallow, no micropunctation between major punctures, nearly glabrous. Pronotum, scutellum and elytra dark reddish brown, diffusely paler at sides of pronotum and elytral apex, pronotum very sparsely punctate, lacking micropunctation, vestiture very fine and sparse, elytral punctation thicker, coarser, but shallow, vestiture sparse and very fine, elytral apex lacking grooves or raised areas, sutural striae traceable for about two thirds

of distance from apex to base. Ventral surface reddish brown with legs, antennae, palpi and prosternum yellowish brown. Protibiae in anterior view widening sharply from base for about one third of length and then inner margin bent so sides nearly parallel to apex, about five times as long as greatest width, inner face of apical portion with series of five flat, slanting plates very close together. Aedeagus in dorsal view with parameres narrowing rapidly from base to form a beak like structure at apex; filiform tip of penis visible between paramere tips; basal piece elongate, slightly wider near junction with parameres; in lateral view basal piece curved ventrally at base, with thin fin along ventral midline, about four times as long as parameres; parameres narrowing from base to apex, curved to form scoop-like structure.

FEMALE [based on specimen from near Pijijiapan, Chiapas, Mexico, July 5, 1965, Paul J. Spangler (USNM)]: Externally like male except lacking secondary sexual modifications of protibiae.

VARIATION: This species includes rather distinct northern and southern groups of populations. The northern group ranges from northern California through Arizona and Texas and south to central Mexico, while the southern group ranges from southern Mexico through Central America (see map, figure 43). The northern group thus includes the cotypes of *minor* while the southern group includes the type of *pusilla*.

Specimens of the northern group average larger and slightly more parallel sided. They also have the aedeagus much narrower in dorsal view, the sides of the basal piece more sinuous, and the basal piece in lateral view slightly less curved dorsoventrally (figures 35 to 38). Although these differences might indicate that the two groups are separate species I have included both in *pusilla* because most specimens from Arizona, Texas, Sonora, and Nayarit are intermediate in size and proportions between typical northern and southern populations. Although the aedeagus of males from these localities looks more like the northern type, the ratio of paramere length/width basal piece[1] clearly shows that this organ also is intermediate; indeed the male cited below from southwest Texas has an aedeagus nearly, but not exactly, like that of the southern group while the aedeagus of the other male from that locality is missing. Thus there seems to be gene flow between northern and southern populations. Measurements of small samples of typical northern, intermediate northern, and southern populations are given below (figures are averages).

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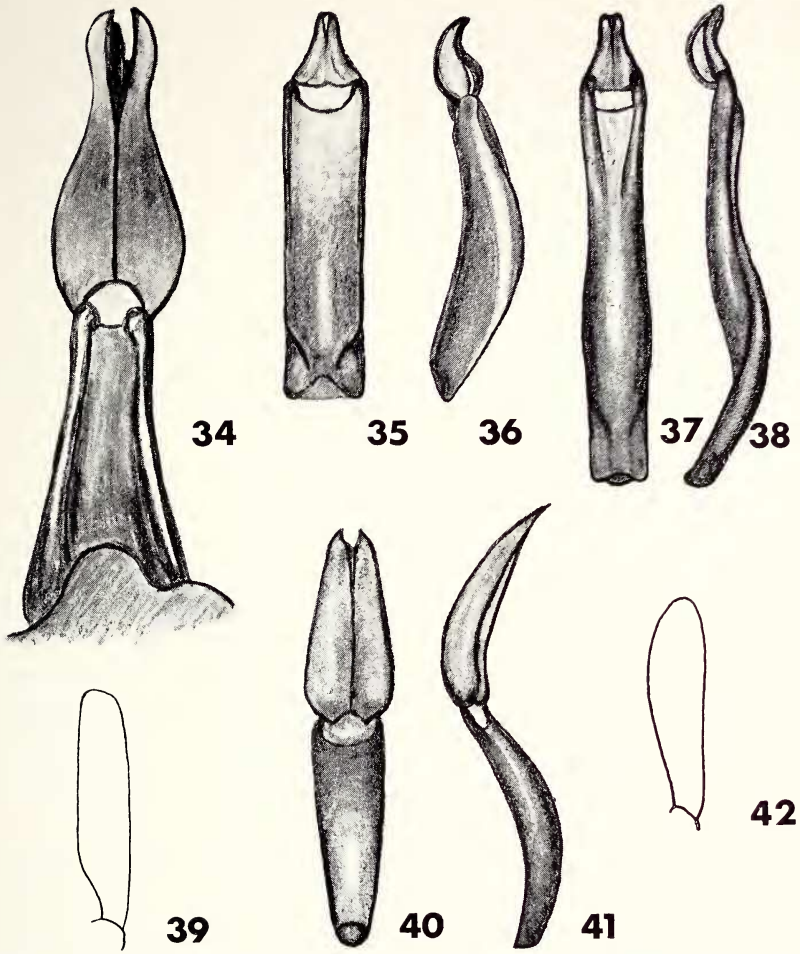
[1] Measured at narrow neck shortly behind juncture with parameres.

Locality	Sample Size	Elytral Length	Greatest Width / Elytral Length	Paramere Length / Width Basal Piece[1]
Typical Northern Populations				
Dry Creek, Mendocino Co., Calif.	2	1.18 mm.	.79	1.40
Bartlett Creek, Lake Co., Calif.	4	1.15 mm.	.82	1.39
San Carlos Bay, Sonora, Mexico	1	1.14 mm.	.81	1.50
Intermediate Northern Populations				
Alamos, Sonora, Mexico	2	1.16 mm.	.81	1.25
Acaponeta, Nayarit, Mexico	2	1.33 mm.	.82	1.33
Arizona (no further locality)	3	1.11 mm.	.81	1.20
Southwest Texas (no further locality)	1	1.14 mm.	.80	.91
Twin Sisters, Blanco Co., Texas	1	1.19 mm.	.88	1.11
Superior, Pinal Co., Arizona	6	1.11 mm.	.82	1.24
Southern Populations				
Tehuantepec, Oaxaca, Mexico	1	.95 mm.	.87	missing
Puente Nacional, Veracruz, Mexico	4	1.02 mm.	.88	.96
Lake Ilopango, La Libertad, El Salvador	4	1.04 mm.	.84	.92
Las Cañas, Guanacaste, Costa Rica	2	1.05 mm.	.80	.96

[1] Measured at narrow neck shortly behind juncture with parameres.

Since the aedeagus of most males from intermediate populations is most similar to that of the northern group, these populations have been included in the northern group in making the map (figure 43).

SPECIMENS EXAMINED: 163 males, 168 females, 7 not sexed. COSTA RICA: *Guanacaste*: Las Cañas, July. EL SALVADOR: *La Libertad*: Lake Ilopango, August. Río Majagual, July. GUATEMALA: *Alta Verapaz*: Cacao, Trece Aguas (♀ only). *El Progreso*: 5 mi. S. of El Progreso, August. San Agustin Acasaguastlan, August (♀ only). *Guatemala*: Guatemala City (paratype of *pusilla*). HONDURAS: *Choluteca*: 5 mi. E. of Choluteca, July. Pespire, July. *Comayuga*: Río Humuya, July. *Mexico*: *Baja California*: Hamilton Ranch, August (♀ only). *Baja California Sur*: 3 mi. NW. of Miraflores, Cañon San Bernardino, Boca de la Sierra, January (♀ only). *Chiapas*: near Pijijiapan, July (♀ only). *Morelos*: Cuautla, Sierra de Durango. MEXICO: Tejupilco, Temescaltepec, June. *Nayarit*: Acaponeta, August. *Oaxaca*: Tehuantepec, July. Zanatepec, June. *Sonora*: Alamos, August. San Carlos Bay, August. *Veracruz*: Puente Nacional, July. UNITED STATES: *Arizona*: PINAL CO.: Riverside. Superior, Boyce Thompson Arboretum, July, September (light trap). *California*: AMADOR CO.: Mokelumne Hill, July. COLUSA CO.: 1.5 mi. SW. of Lodoga, on road to Cooks Springs,



FIGS. 34–42. Fig. 34. *Chaetarthria leechi*, aedeagus, dorsal. Fig. 35. *C. pusilla*, southern group, aedeagus, dorsal. Fig. 36. same, lateral. Fig. 37. *C. pusilla*, northern group, aedeagus, dorsal. Fig. 38. same, lateral. Fig. 39. same, left protibia, anterior face. Fig. 40. *C. brasilia*, aedeagus, dorsal. Fig. 41. same, lateral. Fig. 42. same, left protibia, anterior face.

Indian Creek, April. LAKE CO.: Bartlett Springs, Bartlett Creek, August. 1.7 mi. W. of Kelseyville, Kelsey Creek at Gross Ford, May. LOS ANGELES CO.: Azusa, May. Los Angeles (♀ only). Pasadena, May, August (includes cotype of *minor*). Pomona. Saugus,

Soledad Canyon, August. MARIN CO.: (♀ only). MENDOCINO CO.: Dry Creek, Highway 128. Covelo-Paskenta road, Williams Creek, August (♀ only). MONTEREY CO.: Lewis Creek, August. ORANGE CO.: Santa Ana. RIVERSIDE CO.: Palm Springs, March. Riverside (includes cotype of *minor*). San Jacinto Mountains. SAN BERNARDINO CO.: Hesperia, June (♀ only). San Bernardino, August. SAN DIEGO CO.: Mission Dam, September (♀ only). Oceanside, Camp Pendleton (♀ only). SAN LUIS OBISPO CO.: Nacimiento Reservoir, Bee Rock Campground, July (black light). SANTA BARBARA CO.: Santa Barbara (♀ only). SANTA CLARA CO.: Gilroy Hot Springs, September (♀ only). Mt. Hamilton, August. STANISLAUS CO.: 12 mi. W. of Patterson, Adobe Creek, April. TULARE CO.: Kaweah, April. *Texas*: "SW. Texas." BLANCO CO.: Twin Sisters, May. Females taken without males are only tentatively identified.

Chaetarthria brasilia, new species
(Figures 40, 41, 42, 62)

DIAGNOSIS: The combination of a shining, almost glabrous, dark dorsal surface and small size (elytral length generally 1.1 to 1.3 mm.) easily separates this species from any other known to me in South America. *C. granulata* is similar in size and color but is dull rather than shining dorsally due to the micropunctation of its head and pronotum. See also "Species A" under specimens of uncertain placement; these specimens lack the punctures of the apical half of the elytra seen in *brasilia* and are lighter in color.

DISTRIBUTION: Known only from Jacare, Xingu National Park, Matto Grosso, Brazil.

HOLOTYPE: Male, Jacare, Xingu National Park, Matto Grosso, Brazil, November 1965, at light, M. Alvarenga (USNM). Shape broadly oval, somewhat parallel sided, fairly convex. Head black, impunctate except several very tiny punctures on labrum, lacking micropunctation, glabrous. Pronotum, scutellum and elytra very dark reddish brown except narrowly and diffusely paler at sides of pronotum and elytral apex, smooth and shining, impunctate except some very shallow punctures on apical half of elytra, no micropunctation, glabrous except elytral punctures bearing a few very narrow, long hairs, these hairs widely separated but in definite longitudinal rows, elytral apex lacking grooves or raised areas, sutural striae traceable nearly three quarters of way from apex to base. Ventral surface black with palpi, antennae and prosternum dark brown, legs dark reddish brown. Protibiae in anterior view widening gradually from base for slightly over half of length, then inner margin rounded so

FIG. 43. Distribution of *Chaetarthria pusilla.*

sides converge gradually toward apex, about three times as long as greatest width, medial face of apical portion with two broad, flat, slanting plates on each protibia. Aedeagus in dorsal view with parameres together nearly forming a triangle, medial portion of tip of each paramere extended as small nipple; penis tip slender, visible between paramere tips; basal piece narrower than base of parameres at juncture with them, narrowing anteriorly; in lateral view basal piece only a little longer than parameres, slightly bowed so concave ventrally; parameres slightly concave dorsally, somewhat scoop-shaped. EL 1.10 mm., GW .95 mm., GH .56 mm., GW/EL .86, GH/EL .51, PL .21 mm.

ALLOTYPE: Female, same data as holotype (USNM). Externally like holotype except lacking secondary sexual modifications of protibiae. EL 1.24 mm., GW 1.02 mm., GH .68 mm., GW/EL .82, GH/EL .55.

VARIATION: No noticeable variation is present in the material.

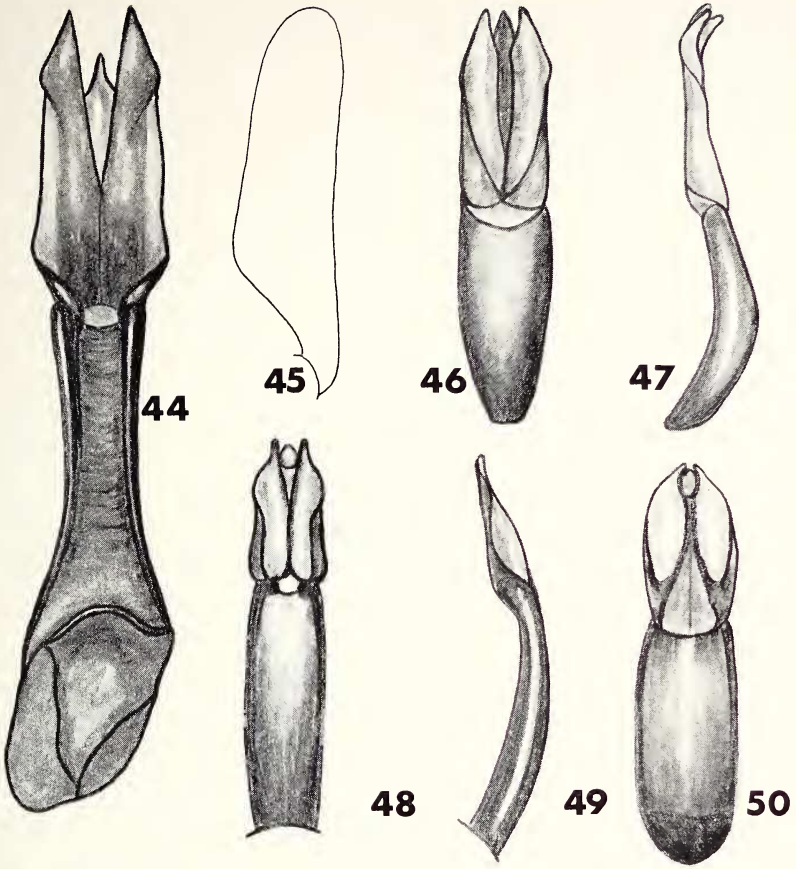
PARATYPES: 37 ♂♂, 24 ♀♀, data as holotype (CNHM, DM, UMMZ, USNM).

Chaetarthria lateralis, new species
(Figures 44, 45, 61)

DIAGNOSIS: The combination of large size (elytral length approximately 1.7 mm.) and black dorsum with distinct pale margins separates this species from any other known to me from South America. The coarse, closely set punctation of the dorsum and the nearly truncate elytral apex, in lateral view, are also unique.

DISTRIBUTION: Known only from near Temuco, Cautín, Chile.

HOLOTYPE: Male, 20 km. E. of Temuco, Cautín, Chile, January 8, 1951, Ross and Michelbacher (CA). Shape oval, somewhat parallel sided at middle, elytral apex somewhat attenuate, in lateral view not very convex, elytral apex bent sharply down so nearly perpendicular to venter, thus posterior appearing truncate. Head black, coarsely and thickly punctate, no micropunctation between major punctures, labral punctures finer, vestiture of head extremely sparse and fine. Pronotum, scutellum and elytra brown (specimen teneral, see section on variation), except yellow on pronotal margins except medial third of posterior margin, elytra yellow at about apical fifth and narrowly along sides, all yellow margins very distinct, pronotal punctation closely set but slightly finer than that of head, pronotum lightly micropunctate between major punctures, vestiture sparse and fine but thicker than that of head, elytral punctation coarse, irregular, most punctures bearing fine hairs pointing posteriorly, punctures forming rather regular longitudinal rows, apex of each elytron with five shallow grooves approaching the sutural stria, sutural striae traceable from apex nearly three quarters of way to base. Ventral surface dark brown with legs distad to tip of femur, palpi and antennae paler. Protibiae in anterior view widening sharply from base for nearly one fourth of length, then gradually narrowing toward apex, nearly four times as long as greatest width, inner face of apical portion with series of flat, slanting plates close together, ten on each protibia. Aedeagus in poor condition due to specimen being teneral, in dorsal view with parameres elongate, triangular, sharply pointed at apex; penis tip visible between parameres, broadly triangular with pointed apex; basal piece elongate; in lateral view basal piece somewhat concave ventrally, about one and one half times length of parameres; parameres concave dorsally, scoop-shaped.



FIGS. 44–50. Fig. 44. *Chaetarthria lateralis*, aedeagus, dorsal. Fig. 45. same, left protibia, anterior face. Fig. 46. *C. pallida*, western group, aedeagus, dorsal. Fig. 47. same, lateral. Fig. 48. *C. pallida*, central group, aedeagus, dorsal. Fig. 49. same, lateral. Fig. 50. *C. pallida*, Florida group, aedeagus, dorsal.

EL 1.66 mm., GW 1.26 mm., GH .84 mm., GW/EL .76, GH/EL .51, PL .35 mm.

ALLOTYPE: Female, same data as holotype (CA). Externally like male except darker portions of both dorsum and venter nearly black, and lacking secondary sexual modifications of protibiae. EL 1.72 mm., GW 1.31 mm., GH .86 mm., GW/EL .77, GH/EL .50.

VARIATION: The male holotype is somewhat paler than the female

allotype and paratype, apparently due to being somewhat teneral. This is noticeable in the pronotal and elytral discs and the darker areas of the venter.

PARATYPE: 1 ♀, same data as holotype (DM).

Chaetarthria pallida (LeConte)
(Figures 46, 47, 48, 49, 50, 51)

Cyllidium pallidum LeConte, 1861, p. 342. Type locality: junction of Colorado and Gila Rivers, California. Type male in Museum of Comparative Zoology, Harvard University (Lectotype, designated by Miller, McCorkle, and Hatch, 1965, p. 46). Type reexamined by me for this study.

Cyllidium nigriceps LeConte, 1861, p. 342. Type locality: Lake Superior. Type female in Museum of Comparative Zoology, Harvard University. Type examined by me for this study. Placed in synonymy by Horn, 1873, p. 125.

Chaetarthria pallida: Horn, 1873, p. 125. Schwarz and LeConte, 1878, p. 439. Wickham, 1895, p. 185. Fall, 1901, p. 12, 216. Blatchley, 1910, p. 259; 1919, p. 320. Leng and Mutchler, 1918, p. 105. Young, 1954, p. 186. Leech and Chandler, 1956, p. 343. Richmond, 1962, p. 88. Miller, McCorkle, and Hatch, 1965, p. 46. Wooldridge, 1967, p. 430. Malcolm, 1971, p. 36.

DIAGNOSIS: This is the only dorsally yellowish species in North America in which the males have plates instead of stalked discs on the inner surface of the protibiae. Some females, however, are very difficult to separate from similar species, particularly *ochra* and light colored specimens of *bicolor*. Most specimens of *pallida* can be excluded from either of the species mentioned above by being from outside their geographical ranges, being micropunctate between the major punctures of the pronotum, or both. Specimens of *ochra* average appreciably larger than those of *pallida* (elytral length for *pallida* generally 1.1 to 1.6 mm. but usually under 1.5 mm. where sympatric with *ochra*, for *ochra* generally 1.6 to 1.8 mm.), and never have darkened or clouded areas on the pronotum, which *pallida* generally have. Specimens of *bicolor* average slightly larger than sympatric *pallida* (elytral length of *bicolor* where sympatric with *pallida* is generally 1.3 to 1.6 mm.), and are often more brownish on the elytra, *pallida* being more yellow. Also, the pronotal disc of *bicolor* is seldom appreciably darker than the elytral disc, a condition common in *pallida*. Additional species which may possibly be confused with *pallida* include the mexican *flava* and *spangleri*; the elytral length of *flava* is generally over 1.3 mm. and of *spangleri* generally

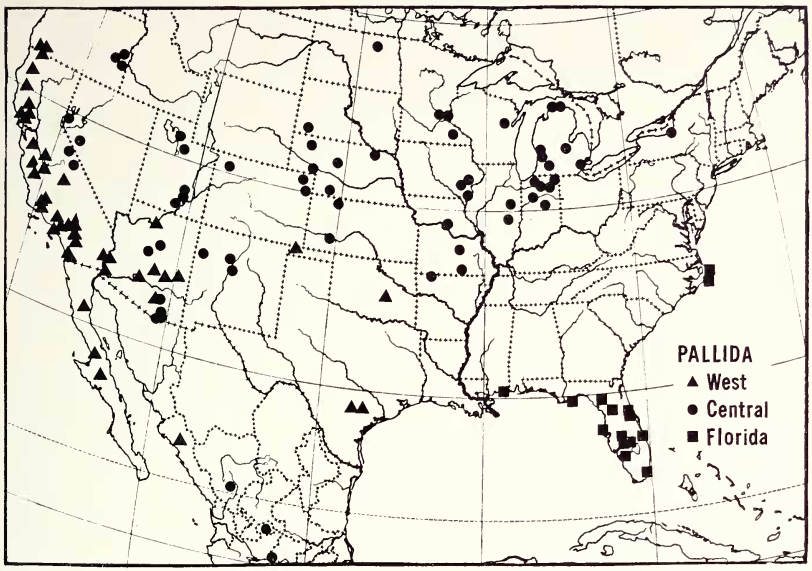


FIG. 51. Distribution of *Chaetarthria pallida*.

over 1.4 mm., and the range of *spangleri* seems to lie entirely south of that of *pallida*.

DISTRIBUTION: Throughout the United States, except not known north of central Oregon on the west coast, or of central New York on the east coast; in Mexico south to Aguascalientes and Durango. Also recorded from Ontario and/or Quebec, Canada (Wickham, 1895, p. 195), but I have not seen specimens from these areas.

MALE [based on holotype of *pallidum* (MCZ)]: Shape oval, fairly convex. Head black, shallowly punctate with no micropunctation between major punctures, labrum more finely and closely punctate, vestiture very sparse, labrum yellowish along margins. Pronotum, scutellum and elytra yellow except pronotal disc, scutellum and elytral humeri clouded with brown, pronotal punctation and vestiture sparse and very fine, no micropunctation between the major punctures, elytral punctation coarser but shallow, not evidently serial in arrangement but elytral apex with several shallow, longitudinal grooves, elytral vestiture of fine hairs more numerous than on pronotum, sutural striae traceable nearly three quarters of way from apex to base. Ventral surface black except legs, prosternum, and antennal club yellowish brown, palpi, sides of third and fourth abdominal segments and remainder of antennae brown. Protibiae

in anterior view widening from base for about half of length, then parallel sided to apex, about three and one half times as long as greatest width, medial face of apical portion with series of short, broad, flat, slanting plates, three on each protibia. Aedeagus in dorsal view with parameres narrow, elongate, parallel sided to apical third, then lateral margin of each paramere curving inward so apex is bluntly rounded; penis tip filiform, visible between parameres; basal piece elongate, nearly parallel sided; in lateral view basal piece bowed dorsally, rather flat, about one and one third times length of parameres; parameres thin, slightly bowed ventrally so scoop-shaped. EL 1.30 mm., GW 1.09 mm., GH .65 mm., GW/EL .84, GH/EL .50, PL .23 mm.

FEMALE [based on specimen from Wickenberg, Arizona, no further data (CA)]: Externally like male except paler parts of venter all yellowish, not brown, and lacking secondary sexual modifications of protibiae.

VARIATION: Included are three fairly distinct groups of populations which can be interpreted either as corresponding to the concept of subspecies, or as three distinct species. I have included all of them within *pallida* but have not used formal trinomials for them. This was done for the following reasons: the groups appear to be completely allopatric, except perhaps at Tucson, Arizona (but see further discussion under the central group); the central group has one of its normally distinctive characters, the micropunctation of the head and pronotum, absent in the southwestern part of its range, suggesting that gene flow occurs in this area between the central and western groups; and the male protibiae, which are distinctive in all other species of the genus in North America, are identical in all three groups. The aedeagus is also quite similar in all three groups, although in all males seen it can easily be placed to group.

Central Group: This group occupies most of the continental United States except for the west and south, extending south through Arizona and New Mexico to the states of Aguascalientes and Durango, Mexico (figure 51). The geographic relationship between this and the western group is rather complex. In Oregon and most of California they are separated by the Cascade and Sierra Nevada mountains, but in southern California this barrier breaks down and the western group extends eastward into southwestern Arizona. There are also two western group males from the Grand Canyon, suggesting that the western group extends north along the Colorado River. Specimens of the western group have also been taken in Texas and Oklahoma in areas of moderate elevation, so these populations

may be continuous with the Arizona ones by way of areas of lower elevation between the mountains of southeastern Arizona, southern New Mexico, and adjacent Texas. In Arizona and New Mexico the central group appears to be limited to higher elevations, and it extends down the Sierra Madre Occidental at least as far as Guanajuato State, Mexico, where a single male has been taken. It is not, however, limited to higher elevations in other parts of its range. Further study could show that this is a case of ecological exclusion between two distinct species. Areas needing further study include Tucson, Arizona, where both groups have been collected (but I do not know enough about the exact collecting sites to know if they are truly sympatric there), and the Oklahoma-Kansas area where the two groups lie rather close together without any obvious ecological distinction between them.

Members of the central group average slightly larger than those of the western group (elytral length for the central group generally 1.3 to 1.6 mm., for the western group generally 1.1 to 1.4 mm.). The parameres are about .17 mm. long and the basal piece, if straightened out, would be about twice the length of the parameres. In their apical quarter the parameres narrow to a slight extension along the inner margins at the tip. The elytral apex is usually not or only very lightly grooved. In lateral view the beetle is not as convex as members of the Florida group (greatest height/elytral length ratio for central generally .47 to .55, for Florida generally .50 to .58). The pronotum is often clouded with brown but is seldom almost entirely dark, a condition common in members of the western group. Most specimens of the central group have the head, pronotum, and often anterior portions of the elytra strongly micropunctate between the major punctures, but west and south of Kansas and Nebraska this micropunctation is light to absent. Thus where the central and western groups lie close together the only reliable means of separating them is the length of the parameres and basal piece.

The type of *Cyllidium nigriceps* LeConte, collected at Lake Superior, belongs to this group (EL 1.31 mm., GW 1.10 mm., GH .70 mm., GW/EL .84, GH/EL .53). I have labeled members of the group "Cent." in collections.

Western Group: This group occupies Oregon and California west of the Cascade and Sierra Nevada mountains, extending east through extreme southern California and southwestern Arizona with specimens known from Texas and Oklahoma, and south through Baja California Sur and coastal Sonora, Mexico. See detailed discussion under the central group.

These beetles average slightly smaller than those of the central group (see measurements under that group) and are similar to the central group in greatest height/elytral length ratio thus being less convex than the Florida group specimens. The parameres are about .22 mm. long and the basal piece, if straightened out, would be no more than about 1.5 times the length of the parameres. The pronotum is almost always at least slightly darkened discally and sometimes it is nearly all very dark brown, except that the specimens from Oklahoma and all but one female from Texas show no pronotal darkening. The elytral apex is often fairly strongly grooved. There is no micropunctation between the major punctures on any part of the dorsum.

The lectotype of *Cyllidium pallidum* LeConte, collected at the junction of the Colorado and Gila Rivers, California, belongs to this group (designated lectotype by Miller, McCorkle, and Hatch, 1965, p. 46). I have labeled members of this group "West." in collections.

Florida Group: Occupies all of Florida and extends north to at least Rodanthe, North Carolina, and west at least to Horn Island, Mississippi. Outside of Florida all of the known collection sites are on islands near the coast, which suggests that the group prefers or at least tolerates slightly saline waters. All of the Floridian localities could possibly be in marshy areas but I have no information as to their salinity.

Beetles of this group average slightly smaller than those of the central group (elytral length for Florida generally 1.1 to 1.5 mm.) and somewhat more convex than those of either of the other groups (see data under central group). They are rather distinctive in being smooth and shining dorsally with very light punctation and no areas clouded or marked with brown. There is seldom any micropunctation between the major punctures dorsally and the elytral apex is never grooved. The parameres are about .17 mm. long and the basal piece, if straightened out, is about 1.5 times the length of the parameres. The paramere tips are fairly broad, and extended slightly along the medial margin. The general lack of dorsal surface sculpture and markings is a characteristic found in some beetles which frequent slightly saline waters, as for example *Berosus metalliceps* Sharp.

Young (1954, p. 186) refers to this group as possibly not belonging to the species *pallida*. I have labeled specimens of the group "Fla." in collections.

SPECIMENS EXAMINED: Central group, 163 males, 230 females, 15 not sexed. Western group, 271 males, 282 females. Florida group, 32 males, 51 females.

Central Group: MEXICO: *Aguascalientes*: Aguascalientes, Au-

gust. *Durango*: 23 mi. S. of Durango, July. *Guanajuato*: San Miguel de Allende, 6397′, August. UNITED STATES: *Arizona*: COCHISE CO.: 5 mi. W. of Portal, South West Research Station, July (♀ only). San Pedro River, Charleston Crossing, March, April. Sierra Vista, Huachuca Mountains, October. MARICOPA CO.: July. PIMA CO.: Santa Catalina Mountains, February, May (♀ only). Tucson, August. SANTA CRUZ CO.: Nogales, August. YAVAPAI CO.: Jerome, August. Skull Valley, July. *Arkansas*: CARROLL CO.: Eureka Springs, April. *California*: INYO CO.: Bigpine, June. MONO CO.: Mono Lake, July. *Colorado*: LOGAN CO.: Iliff, South Platte River, September (♀ only). MOFFAT CO.: 2 mi. E. of Maybell, Deception Creek, 5910′. July. YUMA CO.: 32 mi. S. of Wray, South Fork Republican River, September (black light) (♀ only). *Illinois*: CHAMPAIGN CO.: Mahomet, Nettie Hart Woodland Memorial, June (black light). MOULTRIE CO.: 5 mi. E. of Sullivan, Kaskaskia River, July, August, September (at light). *Indiana*: LAPORTE CO.: July. MARION CO.: Indianapolis, Camp Belzer, August. MARSHALL CO.: June. POSEY CO.: June. STEUBEN CO.: May (♀ only). TIPPECANOE CO.: Lafeyette, July (♀ only). WHITLEY CO.: Loon Lake, August, September. *Iowa*: CEDAR CO.: May (♀ only). DES MOINES CO.: Burlington. JOHNSON CO.: Iowa City. *Kansas*: DECATUR CO.: 2560′ (♀ only). GRAY CO.: Cimarron, Arkansas River, August. *Michigan*: CHEBOYGAN CO.: July. Mullet Lake, Nigger Creek, July (♀ only). EMMETT CO.: Maple River at Brutus Road, T36N, R4W, Section 24–35, July (♀ only). KALAMAZOO CO.: Gull Lake Biological Station, July. MUSKEEGAN CO.: April (♀ only). SAGINAW CO.: Route 47 and Marsh Creek, May (silt river bank). WAYNE CO.: Detroit, June. *Minnesota*: HENNEPIN CO.: Excelsior. OLMSTEAD CO.: Rochester. RAMSEY CO.: St. Paul. *Missouri*: BOONE CO.: Columbia, Hinkson Creek, September. CRAWFORD CO.: 5 mi. W. of Steelville, Meramec River, October. RIPLEY CO.: 5.5 mi. N. of Briar, Buffalo Creek at Route C, August. *Nebraska*: GARDEN CO.: Oshkosh, North Platte River, September. HITCHCOCK CO.: Trenton, Republican River, September. KNOX CO.: 6 mi. S. of Niobrara, Verdigre Creek, June (in moist sand bank). SHERIDAN CO.: 14 mi. S. of Hay Springs, Niobrara River, September. THOMAS CO.: 2.5 mi. W. of Halsey, Nebraska National Forest, July. *Nevada*: MINERAL CO.: Hawthorn, July. ORMSBY CO.: Carson City, July. STOREY CO.: Virginia City, Six Mile Canyon, June (♀ only). *New Mexico*: BERNALILLO CO.: Albuquerque. MCKINLEY CO.: Coolidge. SANDOVAL CO.: Jemez Mountains, August. *New York*: CAYUGA CO.: Fair Haven, July. *North Dakota*: RAMSEY CO.: Mission Bay, Devil's Lake, August

(♀ only). *Oregon*: MALHEUR CO.: Juntura, June (edge of pond). Little Valley, September (margins of hot spring). Sucker Creek Canyon, June. *South Dakota*: FALL RIVER CO.: Angostura Dam, S. of Hot Springs, July. *Texas*: GILLESPIE CO.: Lange's Hill, June (♀ only). *Utah*: No further data ("U.T."). KANE CO.: Escalante River, mouth of Calf Creek, August. UTAH CO.: Utah Lake. WASHINGTON CO.: St. George, July (♀ only). WAYNE CO.: Hanksville, July (sand-oak area, light). 14 mi. S. of Hanksville, July (sand-oak area). WEBER CO.: Roy, July (light trap). *Wisconsin*: SHAWANO CO.: Cloverleaf Lakes, June, September (lakeshore flooding). Females not associated with males are only tentatively identified if they are sympatric with any similar species.

Western Group: MEXICO: *Baja California*: 31 mi. N. of El Arco, December. 2 mi. N. of El Pilar, Arroyo Colorado (♀ only). La Suerta, Sierra San Pedro Martir, 3700′, June (pool in canyon). *Baja California Sur*: San Ignacio, May (stream below dam). *Sonora*: Ciudad Obregon, Río Yaqui (♀ only). San Carlos Bay, August. UNITED STATES: *Arizona*: COCONINO CO.: Grand Canyon, July. GILA CO.: Globe, August. MARICOPA CO.: Gila Bend. Phoenix, July, August. PIMA CO.: Tucson, August. PINAL CO.: Riverside (♀ only). Superior, Boyce Thompson Arboretum, July, September. SANTA CRUZ CO.: Tumacacori Mountains, Yanks' Springs, Sycamore Canyon, August (♀ only). YUMA CO.: Ellenberg, September. Yuma ("Ft. Yuma"). *California*: FRESNO CO.: 4 mi. W. of Coalinga, dry bed Waltham Creek, August. 5.5 mi. SW. of Coalinga, Waltham Creek by Route 198, March. Mendota, April. KERN CO.: Wofford Heights, 2300′, June (at light) (♀ only). LAKE CO.: 1.7 mi. W. of Kelseyville, Kelsey Creek at Gross Ford, December. LOS ANGELES CO.: Azusa, May (♀ only). Pasadena (♀ only). Pico, February (♀ only). Rincon, San Gabriel River, 1800′, September. Saugus, Soledad Canyon, August. Tujunga Canyon, April, May (♀ only). Whittier Narrows Recreation Area, July. MARIN CO.: (♀ only). MENDOCINO CO.: 2 mi. N. of Calpella, Forsythe Creek, October (♀ only). Dry Creek, Highway 128, September (♀ only). South Eel River at confluence with Outlet Creek, Dos Rios Road, August. MONTEREY CO.: Bradley, Salinas River, March. Lewis Creek, August (♀ only). Soledad, August. NAPA CO.: 4 mi. N. of Lake Berryessa, Eticuera Creek, August (♀ only). Pope Creek at Walter Springs Road, August, 520′. ORANGE CO.: November (♀ only). PLACER CO.: Penryn (♀ only). RIVERSIDE CO.: Blythe, Columbia River, April. Elsinore, April. Palm Springs, April (♀ only). Riverside, Santa Ana River, December. SAN BERNARDINO CO.: Hesperia, June. near Victor-

ville, Mojave River, February. SAN DIEGO CO.: Miramar, July. Mission Valley Gorge, April. San Diego, July (at light) (♀ only). San Mateo Canyon, October (berlese, under willow) (♀ only). SAN LUIS OBISPO CO.: 10 mi. W. of Clear Creek, Cuyama Canyon, March (splashing water on sand). SANTA BARBARA CO.: Santa Barbara. SANTA CLARA CO.: Mt. Hamilton, August. SISKIYOU CO.: .7 mi. W. of Seiad, Klamath River, August. SONOMA CO.: Duncan Mills, June. Guerneville, May (♀ only). Rio Nido, July. TULARE CO.: Giant Forest, August (♀ only). 9.5 mi. N. of Kernville, Kern River, March. TRINITY CO.: .5 mi. E. of Hyampom, Hayfork Creek, July. *Oklahoma*: CIMARRON CO.: 25 mi. NW. of Boise City, Black Mesa State Park, S. end Lake Carl Etling, August. HUGHES CO.: Holdenville, July. *Oregon*: JACKSON CO.: Medford, July. JOSEPHINE CO.: 15 mi. SW. of Grants Pass, June. *Texas*: COLORADO CO.: Columbus, July, August. GONZALES CO.: Palmetto State Park, June. PRESIDIO CO.: 5 mi. SE. of Presidio, Alamito Creek, June (black light). Females without males are only tentatively identified.

Florida Group: UNITED STATES: *Florida*: DADE CO.: Biscayne. Biscayne Bay. DIXIE CO.: Old Town, July. FRANKLIN CO.: east end of Dog Island, April. HIGHLANDS CO.: near Avon Park, August. 1 mi. W. of Brighton, March. 6 mi. S. of Lake Placid, Archbold Biological Station, March. LEE CO.: Fort Meyers, March. MARION CO.: Dunnellon, July. PINELAS CO.: Dunedin, March. ST. LUCIEN CO.: Capron, March. SEMINOLE CO.: Sanford, February (black light). VOLUSIA CO.: Enterprise, April, June, December. *Mississippi*: JACKSON CO.: Horn Island. *North Carolina*: DARE CO.: Cape Hatteras, July. 1 mi. N. of Rodanthe, Cape Hatteras National Seashore, July. Females taken without males are considered to be certainly identified and thus not pointed out in the above list.

Chaetarthria pamphila d'Orchymont
(Figures 52, 53, 54, 61)

Chaetarthria pamphila d'Orchymont, 1939, p. 4, 6. Type locality: Corumba, Matto Grosso, Brazil. Type male in Institut Royal des Sciences Naturelles de Belgique. Type and two male paratypes examined by me for this study.

DIAGNOSIS: The elytral vestiture of flat scales nearly half as broad as long appears to be unique; in all other yellowish species known from South America the scales on the elytra are less than one third as broad as long. The vestiture of *pamphila* is often more evident than that of other species and usually has a greenish luster under oblique lighting. Also, *pamphila* is smaller than most other

species likely to be confused with it (elytral length generally under 1.3 mm.), and more parallel sided. Some specimens of *C. argentina* are similar but *argentina* is generally more brownish dorsally than *pamphila*. For males the rounded basal portion of the parameres is diagnostic; females probably should not be determined with certainty if not taken with males.

DISTRIBUTION: Known only from Corumba, Matto Grosso, Brazil.

MALE [based on holotype male, Corumba, Matto Grosso, Brazil (RBM)]: Shape oval, parallel sided in about middle third, fairly convex. Head black, nearly lacking vestiture and punctation except labrum very finely punctate, no micropunctation between the major punctures. Pronotum, scutellum and elytra brownish yellow, pronotum very sparsely and shallowly punctate, no micropunctation between the major punctures, almost no vestiture, elytral punctation coarser but shallow, no evident serial arrangement, apex of each elytron with two slightly raised longitudinal areas, elytral vestiture of flattened scales about twice as long as broad, rather evident in oblique lighting, setae with a slightly greenish luster, sutural striae traceable about three quarters of way from apex to base. Ventral surface black except palpi, antennae, prosternum, legs and abdomen brownish yellow. Protibiae in anterior view widening from base for about half of length, then medial margin gradually curved so sides parallel to apex, about four times as long as greatest width, medial face of apical portion with a series of flat, slanting plates close together, five on each protibia. Aedeagus in dorsal view with parameres rounded at base, together forming nearly a circle, each paramere with narrow, parallel sided extension to apex, about as long as diameter of circle, apex of each paramere slightly pointed on outer margin; penis tip visible between paramere tips; basal piece with straight sides slightly convergent from juncture with parameres to base; in lateral view basal piece slightly bowed dorsally, about two and two thirds times length of parameres; parameres thin, nearly straight, slightly narrowing from base to apex. EL 1.21 mm., GW .98 mm., GH .67 mm., GW/EL .81, GH/EL .55, PL .16 mm.

FEMALE [based on specimen with same data as holotype (DM)]: Externally like male except lacking secondary sexual modifications of protibiae.

VARIATION: There is little appreciable variation in the single known series except for some differences in color and punctation.

SPECIMENS EXAMINED: 19 males, 9 females, 1 not sexed (all type locality).

Chaetarthria hermani, new species
(Figures 55, 56, 61)

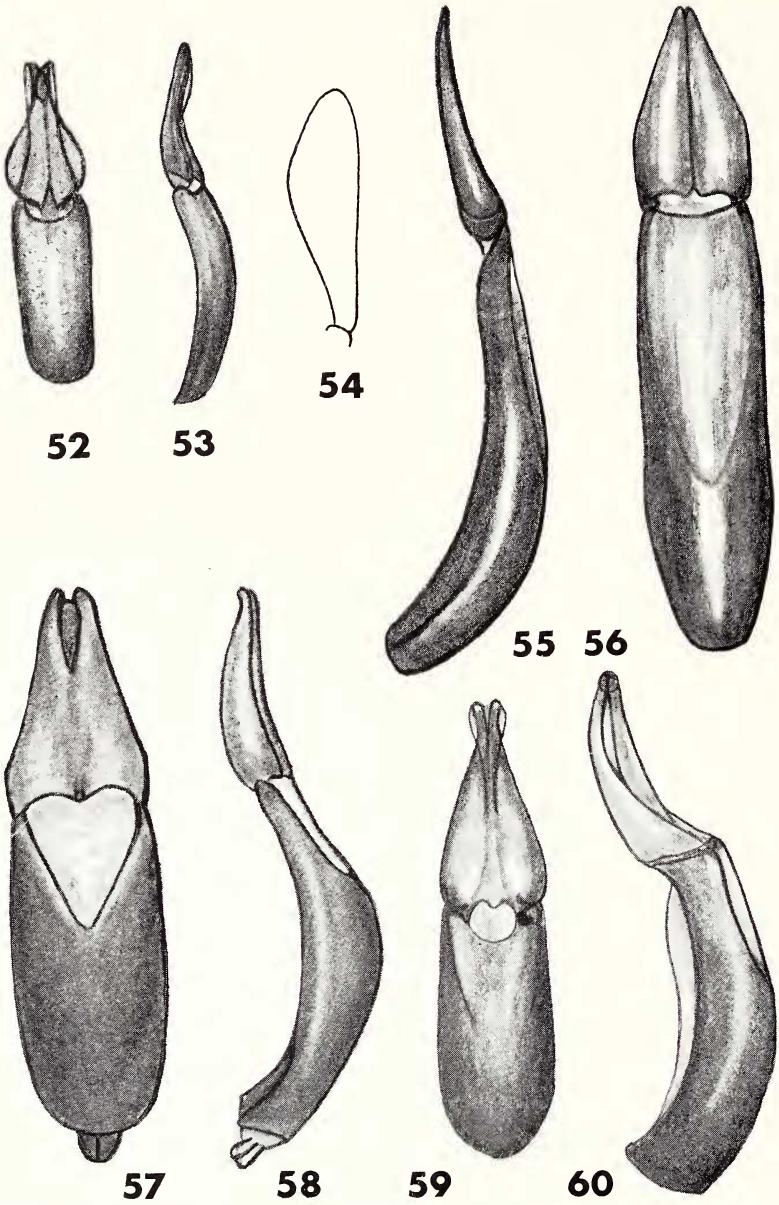
DIAGNOSIS: The dark brown pronotum and elytra are unique among species known from South America; the teneral holotype of *C. lateralis* is also dark brown but has a distinct pale margin, which *hermani* lacks. *C. granulata* is reddish brown and is strongly micropunctate on the head and pronotum; it also has much more evident dorsal vestiture than *hermani*. The aedeagus of *hermani* is similar to that of *argentina* but is more slender, with a longer basal piece. The elytra are generally 1.2 to 1.5 mm. long.

This species is named in honor of Dr. Lee Herman, of the American Museum of Natural History, who collected all of the known specimens and who has been very helpful to me during the final phases of this work.

DISTRIBUTION: Tucumán and La Rioja provinces, Argentina.

HOLOTYPE: Male, 7 km. W. of San Pedro de Colalao, Tucumán, Argentina, December 15, 1971, Lee Herman (AMNH). Shape oval, parallel sided in about middle third, somewhat convex. Head black, punctation and vestiture very sparse except labrum with many fine punctures, lacking micropunctation. Pronotum, scutellum and elytra dark reddish brown except pronotum with brownish lateral margins extending inward for short distance along anterior edge, pronotum nearly impunctate, lacking micropunctation, nearly glabrous, elytra lightly but fairly thickly punctate, punctation not evidently serial, each elytron with two slightly raised longitudinal areas at apex, elytral vestiture fairly thick and fairly evident in oblique lighting, shining against dark background, sutural striae traceable nearly three quarters of way from apex to base. Ventral surface dark reddish brown except palpi, antennae, prosternum, legs, and abdomen yellowish brown. Protibiae in anterior view widening from base for about half of length, then nearly parallel sided to apex, about four times as long as greatest width, inner face of apical portion with series of flat, slanting plates, four plates on each protibia. Aedeagus in dorsal view with parameres together forming an elongate triangle with lateral margins slightly elbowed at about middle; penis not visible between parameres; basal piece long and nearly parallel sided; in lateral view basal piece slightly concave ventrally near base, thicker near base, if straightened out would be over two and one half times length of paramere; paramere a thin, long triangle. EL 1.47 mm., GW 1.12 mm., GH .75 mm., GW/EL .76, GH/EL .51, PL .23 mm.

ALLOTYPE: Female, same data as holotype (AMNH). Externally like holotype except lacking secondary sexual modifications of



FIGS. 52–60. Fig. 52. *Chaetarthria pamphila*, aedeagus, dorsal. Fig. 53. same, lateral. Fig. 54. same, left protibia, anterior face. Fig. 55. *C. hermani*, aedeagus, lateral. Fig. 56. same, dorsal. Fig. 57.

protibiae. EL 1.49 mm., GW 1.23 mm., GH .77 mm., GW/EL .82, GH/EL .52.

VARIATION: Except for moderate differences in punctation and vestiture the known specimens exhibit little variation.

PARATYPES (total 4 ♂♂, 5 ♀♀): ARGENTINA: *La Rioja*: 5 km. E. of Chilecito, 1500 m., 1 ♀, November 30, 1971, Lee Herman (AMNH). *Tucumán*: same data as holotype, 4 ♂♂, 4 ♀♀ (AMNH, DM).

Chaetarthria argentina, new species
(Figures 57, 58, 62)

DIAGNOSIS: The combination of small size (elytral length generally under 1.6 mm.), rather parallel sided outline and generally rather evident elytral vestiture separate this species fairly well from all other yellow to yellowish brown species in South America except *C. pamphila*, which is generally slightly lighter than *argentina* and a little more yellowish. Most of the known specimens of *argentina* were taken together with *goldbachi*, which is also somewhat more yellowish and slightly more rounded in outline. *C. hermani* is rather parallel sided, as is *argentina*, but is a slightly darker, less yellowish brown than *argentina*. It has a very similar aedeagus which differs by being more slender with a longer basal piece. The similarity of *argentina* to the darker *hermani* on the one hand and to the lighter *pamphila* on the other hand makes identification without examining the aedeagus uncertain. The elytral vestiture in *argentina* is fairly evident, much as in *pamphila*, but the individual scales are less than a third as broad as long as compared to nearly half as broad as long in *pamphila*.

DISTRIBUTION: Tucumán province, Argentina.

HOLOTYPE: Male, Concepción, Tucumán, Argentina, December 21 to 31, 1946, R. Goldbach (UT). Shape oval, parallel sided in about middle third, somewhat convex. Head black, punctation sparse except labrum with many fine punctures, lacking micropunctation, vestiture fairly thick. Pronotum, scutellum and elytra yellowish brown, pronotal punctation very sparse, lacking micropunctation, vestiture moderately thick, elytral punctation coarser and thicker, not evidently serial, each elytron with two slightly raised longitudinal areas near apex, elytral vestiture moderately thick and fairly evident in oblique lighting, sutural striae traceable for nearly three quarters

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C. argentina, aedeagus, dorsal. Fig. 58. same, lateral. Fig. 59. *C. pamphiloides*, aedeagus, dorsal. Fig. 60. same, lateral.

of way from apex to base. Ventral surface dark brown except legs, antennae, palpi, and metasternum yellow, abdomen yellowish brown. Protibiae in anterior view widening sharply from base for about half of length, then narrowing toward apex, slightly less than four times as long as greatest width, medial face of apical portion with series of flat, slanting plates, five on each protibia. Aedeagus with parameres in dorsal view forming an elongate triangle with lateral edges curved slightly near base; penis triangular with tip visible extending between tips of parameres; basal piece elongate and nearly parallel sided; in lateral view basal piece rather humped dorsally, slightly concave ventrally, if straightened out would be slightly over one and one half times length of parameres; parameres flat, very slightly bowed ventrally. EL 1.40 mm., GW 1.16 mm., GH .70 mm., GW/EL .83, GH/EL .50, PL .21 mm.

FEMALE [based on specimen with same data as holotype (UT), no allotype designated]: Externally like holotype except lacking secondary sexual modifications of protibiae.

VARIATION: Aside from some difference in punctation and vestiture, there is little known variation. The single male from near San Pedro de Colalao was taken with *hermani* and is slightly lighter than those from Concepción, suggesting the possibility of character displacement caused by the presence of the darker *hermani*, but certainly no definitive statement can be made on the basis of one specimen. Alternatively, it is possible that *hermani* and *argentina* are not separate species, as the differences in color, protibiae and aedeagus are slight and could be interpreted as geographic variation were it not for the presence of both types near San Pedro de Colalao.

PARATYPES AND FEMALES (total 107 ♂♂, paratypes, 79 ♀♀, not paratypes): ARGENTINA: *Tucumán*: 105 ♂♂, 78 ♀♀, data as holotype (AMNH, CA, CNC, CNHM, BM, DM, IU, RBM, USNM, UT). No further locality, 1 ♂, January 1956, R. Goldbach (UT). 7 km. W. of San Pedro de Colalao, 1 ♂, December 15, 1971, Lee Herman (AMNH).

Chaetarthria pamphiloides d'Orchymont
(Figures 59, 60, 62)

Chaetarthria pamphiloides d'Orchymont, 1939, p. 4, 6. Type locality: Río Alto Parana, Paraguay. Type (? see section on variation) plus male paratype in Institut Royal des Sciences Naturelles de Belgique. Paratype examined by me for this study.

DIAGNOSIS: Males of this species can be easily identified by the elongate, narrow tips of the parameres but females are not apparently

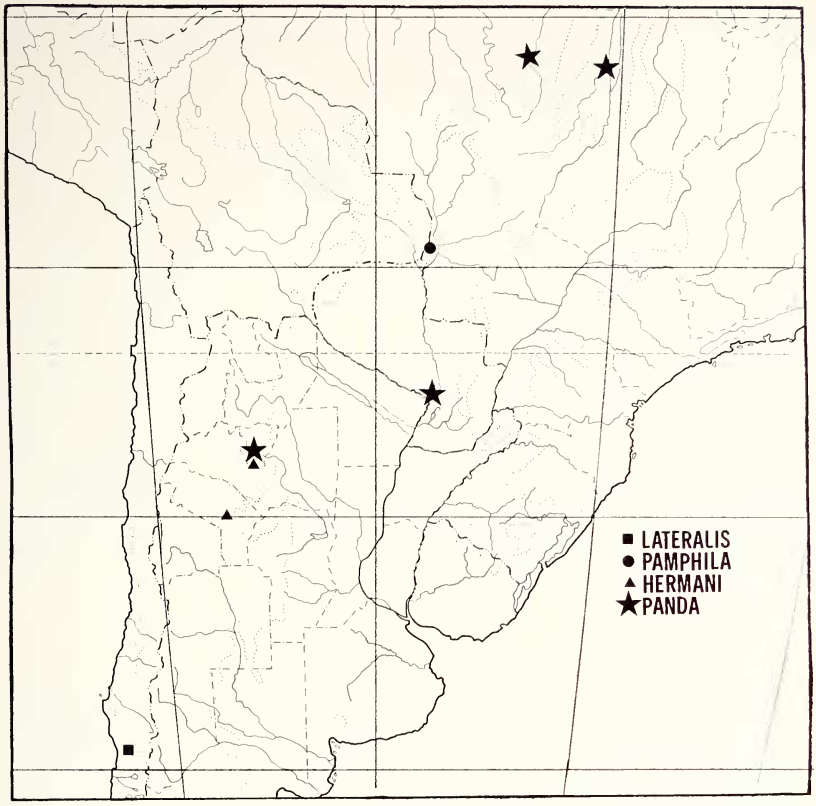


FIG. 61. Distribution of *Chaetarthria lateralis*, *C. pamphila*, *C. hermani* and *C. panda*.

distinguishable from any of the remaining four species of the group. See further comments in the section on variation.

DISTRIBUTION: Known certainly only from Río Alto Parana, Paraguay and Goias state, Brazil, and possibly from Alagoas state, Brazil.

MALE [based on paratype, Río Alto Parana, Paraguay, February, 1937, Ihamisi (RBM)]: Shape oval, somewhat parallel sided at middle. Head black, shining, nearly impunctate except fine punctures on labrum, lacking micropunctation, nearly glabrous. Pronotum, scutellum and elytra slightly brownish yellow, pronotum shining, glabrous, without major punctation or micropunctation, elytral punctation very shallow, vestiture of fine hairs not easily seen, elytral apex

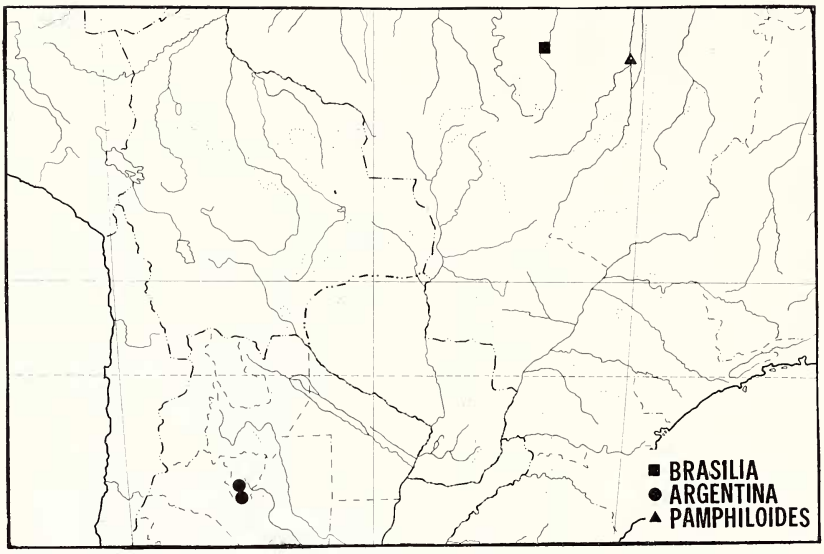


FIG. 62. Distribution of *Chaetarthria brasilia*, *C. argentina* and *C. pamphiloides*.

with four very light striae on each elytron, sutural striae traceable about two thirds of way from apex to base. Ventral surface black except prosternum, legs, antennae, and palpi yellow, abdomen dark brown. Protibiae in anterior view widening from base for about half of length, then inner margin elbowed so parallel sided to apex, about three and one half times as long as greatest width, medial face of apical portion of each protibia with series of seven narrow, slanting plates very close together. Aedeagus in dorsal view with parameres narrowing gradually and evenly from base to near apex but apex attenuate; tip of penis slender; basal piece elongate and nearly parallel sided, slightly broader anteriorly than at juncture with parameres; in lateral view basal piece slightly concave ventrally, nearly one and one half times length of parameres; parameres slightly concave dorsally.

FEMALE: Not certainly known (see section on variation).

VARIATION: The type and paratype are the only specimens known which certainly belong to this species (see final paragraph below) but a male from Rio Araguaia, Ilha do Bananal, Santa Isabel, Goias, Brazil [August 12 to 22, 1957, Borys Malkin (CA)] has genitalia identical to the paratype. It is more brownish, has the

head and pronotum strongly micropunctate between the major punctures, has the only remaining protibia somewhat less sharply elbowed on the inner margin, has only six protibial plates, and is about one quarter smaller. Since both size, and micropunctation of the head and pronotum can vary within species (for example *pallida*), and since the aedeagus and probably the protibiae are within a reasonable range of variation, I include the specimen under *pamphiloides* (labeling it "? *pamphiloides*").

There is also a female from Cachoeira Paulo Affonso, Alagoas, Brazil, [March 24, 1936, Schubart (RBM)] which d'Orchymont had before him at the time of his original description, but then referred to in a later paper (1943, p. 64) as "? *pamphiloides.*" The specimen is essentially identical to the male paratype except lacking the secondary sexual modifications of the protibiae, but I am not able to separate females of the various yellowish South American species so am uncertain as to what species this represents.

In d'Orchymont's original description he mentions only a type and a female, but the male I have seen from the Institut Royal des Sciences Naturelles de Belgique is labeled "paratype."

Chaetarthria panda d'Orchymont
(Figures 61, 63, 64, 65)

Chaetarthria panda d'Orchymont, 1939, p. 4, 7. Type locality: Río Alto Parana, Paraguay. Type male (? see section on variation) plus male paratype in Institut Royal des Sciences Naturelles de Belgique. Male paratype examined by me for this study.

Chaetarthria panthea d'Orchymont, 1939, p. 4, 7. Type locality: Tucumán Province, Argentina. Type male in Institut Royal des Sciences Naturelles de Belgique, examined by me for this study. **NEW SYNONYMY.**

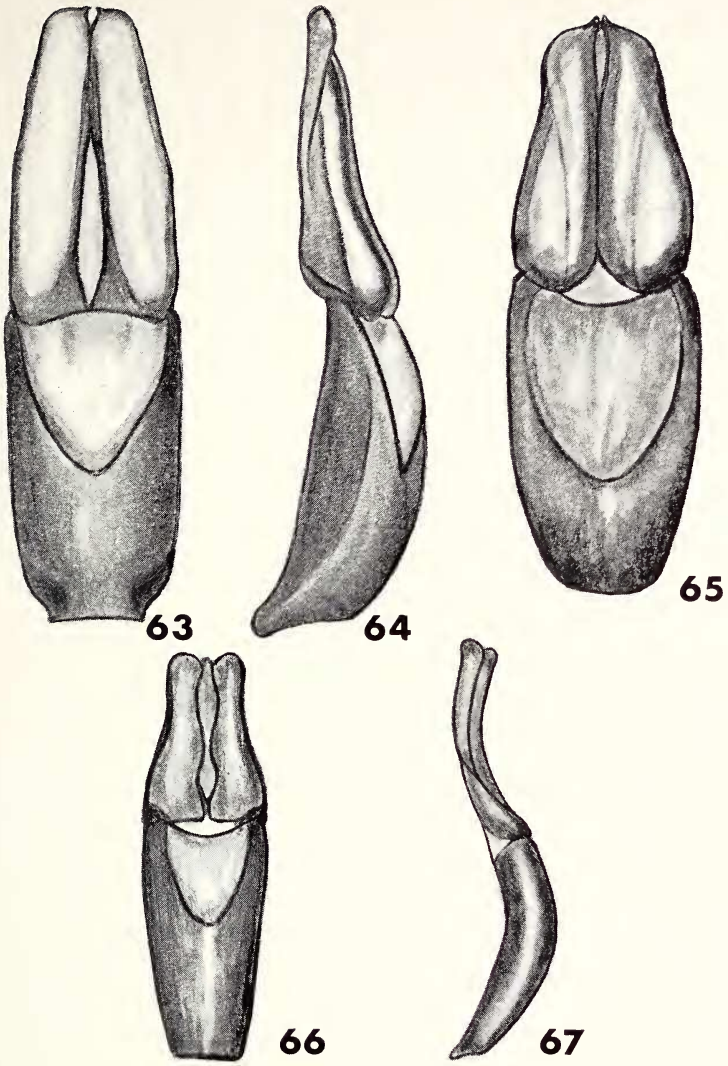
DIAGNOSIS: The form of the aedeagus is diagnostic but must be used with caution because if it is subject to drying the edges of the parameres will often curl dorsally, changing the apparent shape (see section on variation). *C. malkini* has a similar aedeagus but is smaller (elytral length generally under 1.4 mm. compared to generally over 1.5 mm. for *panda*) and has the male protibiae elbowed about one third of the way from the base as compared to about half of the way for *panda.* The aedeagus of *goldbachi* is also similar in shape but the parameres are less membranous dorsally. Females can not be distinguished with certainty from those of related species.

DISTRIBUTION: Tucumán Province, Argentina, north to the state of Matto Grosso, Brazil; probably also in Uruguay and Peru.

MALE [based on paratype, Río Alto Parana, Paraguay (RBM)]: Shape oval, somewhat parallel sided at middle, somewhat convex. Head black, major punctures fairly coarse but sparse, with evident micropunctation between the major punctures, labrum finely and thickly punctate, little evident vestiture. Pronotum, scutellum and elytra slightly brownish yellow, pronotum sparsely provided with major punctures but micropunctation evident in some areas, little evident vestiture, elytra with major punctures larger, shallow, not evidently serially arranged, lacking micropunctation, apex of each elytron with two very slightly raised longitudinal areas but no apical grooves, vestiture moderately thick but not very evident, sutural striae traceable nearly three quarters of way from apex to base. Ventral surface black except legs, palpi, antennae, prosternum and apical half of abdomen yellowish brown. Protibiae in anterior view widening sharply from base for about half of length, then inner margin curved so margins slightly convergent to apex, about four times as long as greatest width, medial face of apical portion with series of flat, slanting, narrow plates close together, eight on each protibia. Aedeagus in dorsal view with parameres nearly rectangular and truncate at tip except that in drying lateral margins of apical portion have curled so apical portion looks narrower (see section on variation), most of center of dorsum of each paramere membranous; penis not visible; basal piece elongate, parallel sided; in lateral view basal piece concave ventrally, about one and one half times length of parameres if straightened out; parameres thin and nearly flat.

FEMALE [based on specimen from Jacare, Xingu National Park, Matto Grosso, Brazil (DM)]: Externally like male except lacking secondary sexual modifications of protibiae.

VARIATION: The specimens from Santa Isabel, Rio Araguaia, Matto Grosso, Brazil and the single female from Montevideo, Uruguay are paler and less brownish and the Montevideo specimen has the elytral humeri and punctures marked with dark brown (it is only tentatively identified as this species). The aedeagus varies much more in size than that of most species, that of males from Matto Grosso having a paramere length of about .35 mm. while the paratype from Río Alto Parana and the specimens from Argentina have a paramere length of about .28 mm. The tips of the parameres of specimens from Brazil tend to curl laterally on drying, thus making the apical portion of the parameres appear narrower and less truncate; this does not occur in Argentine specimens. This caused d'Orchymont to consider the Argentine material to be a separate species, *C. panthea* (compare figures 5 and 6 in d'Orchymont 1939, and figures 63, 64



FIGS. 63–67. Fig. 63. *Chaetarthria panda*, aedeagus curled on drying (specimen from Brazil), dorsal. Fig. 64. same, lateral. Fig. 65. same, aedeagus not curled on drying (specimen from Argentina), dorsal. Fig. 66. *C. malkini*, aedeagus, dorsal. Fig. 67. same, lateral.

and 65 in this work). He also pointed out that the Argentine specimens lack micropunctation of the head and pronotum. These differences are consistent with the idea that this is a single, geographically variable species, so I have considered *panthea* to be a synonym of *panda*.

C. panda is sympatric with *malkini* and *goldbachi* at Santa Isabel, Matto Grosso, and with *goldbachi* at Jacare, Xingu National Park, Matto Grosso, so all three appear to be separate species although the differences between them are not very great.

Although d'Orchymont's original description (1939) mentions only the single male holotype plus the female from Montevideo, the topotypic male I have seen is labeled paratype.

SPECIMENS EXAMINED: 58 males, 78 females. ARGENTINA: *Tucumán*: No further locality (holotype of *panthea*, RBM). Concepción, December. BRAZIL: *Goias*: Santa Isabel, Rio Araguaia, Isla do Bananal, October or November (♀ only). *Matto Grosso*: Jacare, Xingu National Park, November (at light). Rio Araguaia, Santa Isabel, August. PARAGUAY: Río Alta Parana, February. *Asunción*: 2 km. north of Luque, June. PERU: *Lima*: Mouth of Río Rimac, close to Pacific, June (♀ only). URUGUAY: *Cancelones*: Montevideo (♀ only). Females taken without males are only tentatively identified.

Chaetarthria malkini, new species
(Figures 66, 67, 68)

DIAGNOSIS: The aedeagus of this species is diagnostic but that of *panda* is similar although larger (paramere length for *malkini* usually .21 to .23 mm., for *panda* usually .26 to .38 mm.). The elytral length of *malkini* is generally under 1.4 mm. while that of *panda* is generally over 1.5 mm.; the male protibia of *panda* has the elbow at about the middle while in *malkini* it is about one third of the way from the base. *C. goldbachi* also has a similar aedeagus in which the parameres are less membranous dorsally and their sides are more sinuate so that the tip is attenuate. The elytral length is rather variable.

Females are difficult to identify. All three species mentioned above have been collected at Santa Isabel, Matto Grosso; in that series *panda* females are larger than the other two species and they have micropunctation on the head and pronotum. Females of *goldbachi* and *malkini* are smaller, *malkini* being slightly lighter in color and more robust than *goldbachi*, while *goldbachi* is micropunctate on the head and pronotum and *malkini* is not. These differences,

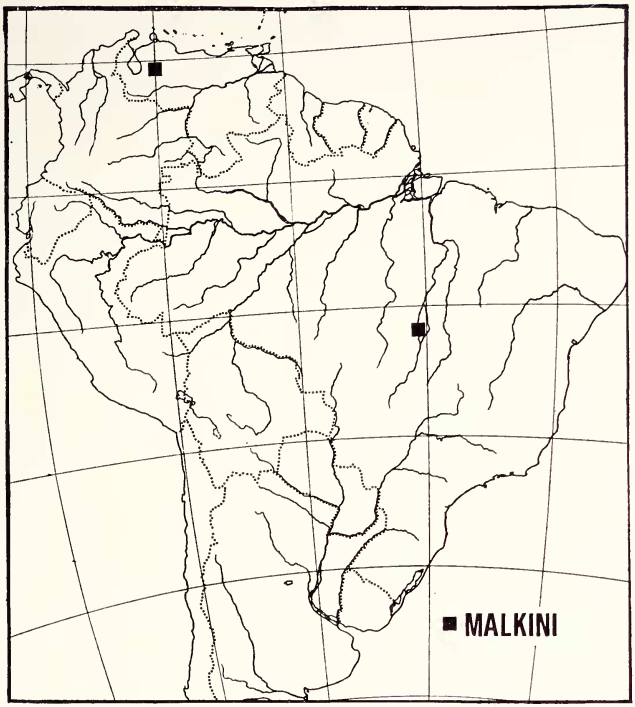


FIG. 68. Distribution of *Chaetarthria malkini.*

however, do not hold up for collections of each of these species by itself in other areas (see section on variation for each species).

This species is named for Mr. Borys Malkin, who collected all of the known specimens as well as specimens of several other species from South America.

DISTRIBUTION: Santa Isabel, on border of Matto Grosso and Goias, Brazil, and Portugesa Province, Venezuela.

HOLOTYPE: Male, Santa Isabel, Matto Grosso side of Rio Araguaia, Brazil (CA). Shape oval, somewhat convex. Head black, nearly glabrous and impunctate except labrum with many small punctures, no micropunctation. Pronotum, scutellum and elytra slightly brownish yellow, pronotum shining, with only a few scattered hairs and a few scattered punctures, no micropunctation, elytral punctures more numerous and larger, but shallow, not evidently serial, vestiture fairly thick but not evident, apex of each elytron with two slightly raised longitudinal areas, sutural striae traceable nearly three fourths

of way from apex to base. Ventral surface of head black except antennae and palpi yellowish, rest of venter dark reddish brown except prosternum and legs yellowish. Protibiae in anterior view widening sharply from base for about one third of length, then inner margin bent so sides nearly parallel to apex, about three and one half times as long as greatest width, medial face of apical portion with series of flat, slanting plates close together, six on each protibia. Aedeagus in dorsal view with parameres elongate, nearly rectangular but slightly narrower at the tip, membranous on much of center of dorsum of each paramere; penis not visible; basal piece parallel sided, not very long; in ventral view slightly concave ventrally, about one and one half times length of parameres; parameres thin and slightly concave dorsally. EL 1.26 mm., GW 1.02 mm., GH .60 mm., GW/EL .81, GH/EL .47, PL .21 mm.

FEMALE [based on specimen with same data as holotype (CA), no allotype designated]: Externally like male except lacking secondary sexual modifications of protibiae.

VARIATION: There is minor variation in punctation, color, and presence of very slightly raised longitudinal areas on the elytral apex. The number of plates on the male protibiae varies from six to nine, a wider range than found in most species.

PARATYPES AND FEMALES (total 21 males, paratypes, 17 females, not paratypes): BRAZIL: *Goias*: Santa Isabel, Rio Araguaia, Ilha do Bananal, 1 ♂, July 15 to 22, 1957, Borys Malkin (CA). *Matto Grosso*: Rio Araguaia, Santa Isabel, 19 ♂♂, 17 ♀♀, August 10 to 20, 1957, Borys Malkin (CA, DM). VENEZUELA: *Portugesa*: Guanare, 1 ♂, September 10 to 13, 1957, Borys Malkin (CA).

Chaetarthria goldbachi, new species
(Figures 69, 70, 76)

DIAGNOSIS: The aedeagus is diagnostic, but somewhat similar to that of *malkini* and *panda*; see the diagnoses of those species for further comment. The aedeagus of *bruchi* is also similar but has the tips of the parameres more truncate and the basal piece more elongate and less bulbous anteriorly.

Females are difficult to separate from related species. The diagnosis of *malkini* gives characters which separate it from *goldbachi* where they have been taken together. Where it occurs with *argentina*, at Concepción, Tucumán, Argentina, *goldbachi* averages larger (elytral length generally over 1.6 mm. as compared to generally under 1.5 mm. for *argentina*), a little more rounded in outline, and slightly more yellowish dorsally with the elytral vestiture not as evident.

C. bruchi also occurs in Tucumán Province and I am unable to separate females of that species from those of *goldbachi*.

This species is named in honor of Dr. R. Goldbach, who collected the largest series of specimens of it.

DISTRIBUTION: Matto Grosso and Goias, Brazil, Portugesa, Venezuela, and Tucumán, Argentina.

HOLOTYPE: Male, Concepción, Tucumán, Argentina, December 21 to 31, 1946, R. Goldbach (UT). Shape broadly oval, somewhat convex. Head black, punctation sparse and shallow except labrum with many fine punctures, lacking micropunctation between the major punctures, vestiture very sparse. Pronotum, scutellum and elytra slightly brownish yellow with elytral humeri marked with brown, pronotal punctation sparse and shallow, surface shining, lacking micropunctation, vestiture extremely sparse, elytral punctation somewhat deeper, punctures more numerous, not evidently serial but elytral apex with five very shallow, short, longitudinal grooves on each elytron, vestiture fairly thick but not evident, sutural striae traceable nearly three quarters of way from apex to base. Ventral surface black except palpi, antennae, prosternum and legs brownish yellow, abdomen dark brown but paler at sides. Protibiae in anterior view widening sharply from base for about half of length, then inner margin bent so sides slightly convergent to apex, about three and one half times as long as greatest width, medial face of apical portion with series of flat, slanting plates close together, ten on each protibia. Aedeagus in dorsal view with parameres elongate, rounded at tip with apex slightly pointed, slightly sinuate a little more than a third of way from tip, paramere dorsum membranous only on apical portion; penis tip just visible between parameres back of tip; basal piece bulbous at anterior end; in lateral view basal piece thick, somewhat concave ventrally, about one and one half times length of parameres; parameres thick at base, narrowing to apex, concave dorsally so scoop-shaped. EL 1.66 mm., GW 1.31 mm., GH .79 mm., GW/EL .79, GH/EL .46, PL .33 mm.

FEMALE [based on specimen with same data as holotype (UT), no allotype designated]: Externally like male except lacking secondary sexual modification of protibiae.

VARIATION: Minor variation occurs in coloration, darkening of elytral humeri, tendency for attenuation of elytral apex, and punctation. In addition, the material included here represents two rather different groups of specimens which could possibly be different species. The specimens from Argentina average larger (elytral length generally over 1.6 mm.), darker in color, lack micropunctation on

the head and pronotum and have the tips of the parameres broader and less attenuate. Those from Brazil and the single specimen from Venezuela are smaller (elytral length generally under 1.4 mm.), more yellowish dorsally (although some specimens are as dark as those from Argentina), have the head and pronotum variable from very indistinctly to quite clearly micropunctate, the tips of the parameres narrower and more attenuate, and the elytral apex sometimes somewhat attenuate. These slight differences all appear consistent with the idea that this is a single, geographically variable species.

PARATYPES AND FEMALES (total 110 males, paratypes, 140 females, not paratypes): ARGENTINA: *Tucumán*: Concepción, 74 ♂♂, 80 ♀♀, December 21 to 31, 1946, R. Goldbach (AMNH, BM, CA, CNC, CNHM, DM, IU, RBM, USNM). 7 km. W. of San Pedro de Colalao, 4 ♂♂, December 15, 1971, Lee Herman (AMNH). BRAZIL: *Goias*: Santa Isabel, Ilha do Bananal, Rio Araguaia, 1 ♂, August 10 to 20, 1957, Borys Malkin (CA). *Matto Grosso*: Santa Isabel, Rio Araguaia, 25 ♂♂, 44 ♀♀, July 12 to 22, 1957, Borys Malkin (CA, DM). Jacare, Xingu National Park, 5 ♂♂, 16 ♀♀, November 1965, Alvarenga and Werner (at light) (CNHM, IU, USNM). VENEZUELA: *Portugesa*: Guanare, 1 ♂, September 10 to 13, 1957, Borys Malkin (CA).

Chaetarthria bruchi Balfour-Browne
(Figures 71, 72, 93)

Chaetarthria bruchi Balfour-Browne, 1939, pp. 300–301. Type locality: Tucumán (city or province ?), Argentina. Type male and allotype female in British Museum (Natural History). Type not examined for this study.

DIAGNOSIS: The aedeagus is diagnostic due to the truncate tips of the parameres; several other species have a similar aedeagus which is more or less rounded at the tip. Females are very similar to those of other species in Argentina, particularly *C. goldbachi*, and should not be identified without reference to accompanying males. The elytral length is usually 1.5 to 1.7 mm.

DISTRIBUTION: Tucumán and Córdoba provinces, Argentina.

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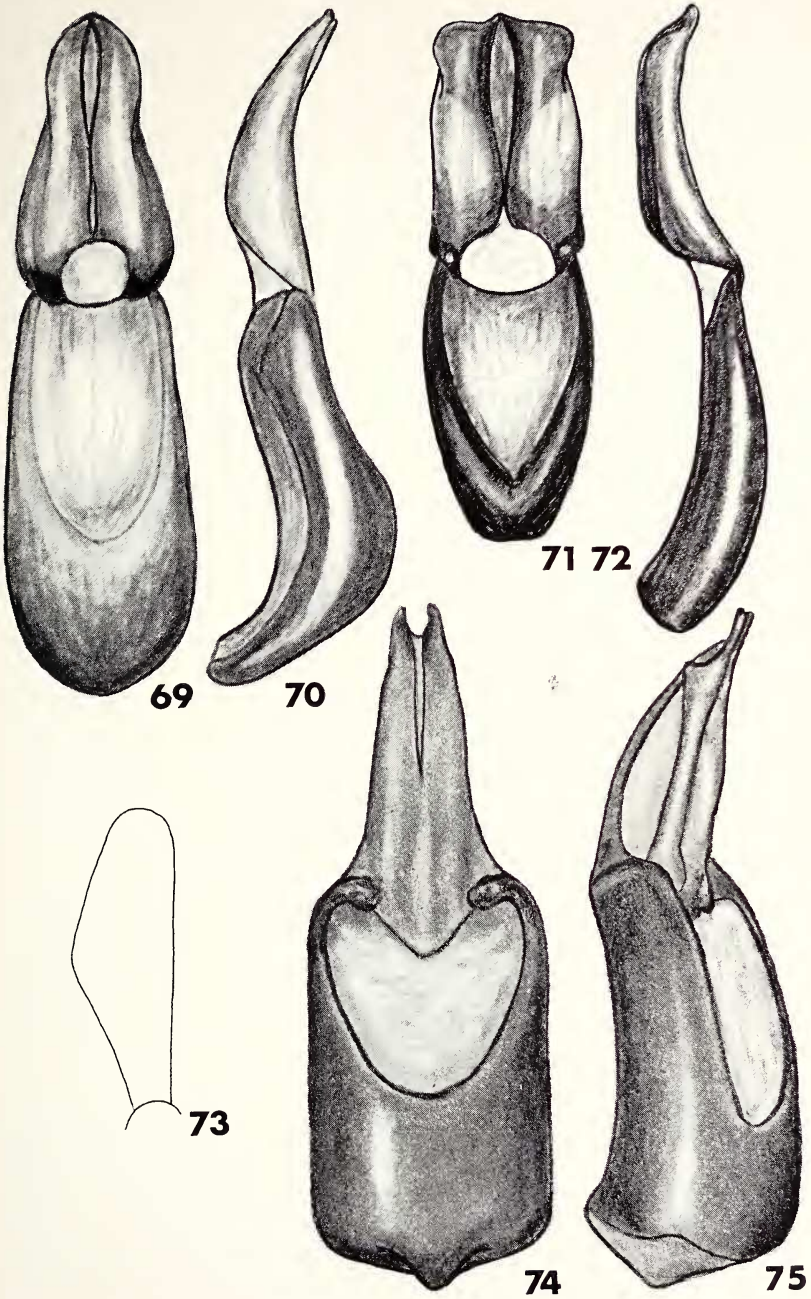
FIG. 69–75. Fig. 69. *Chaetarthria goldbachi*, aedeagus, dorsal. Fig. 70. same, lateral. Fig. 71. *C. bruchi*, aedeagus, dorsal. Fig. 72. same, lateral. Fig. 73. *C. spangleri*, left protibia, anterior face. Fig. 74. same, aedeagus, dorsal. Fig. 75. same, lateral.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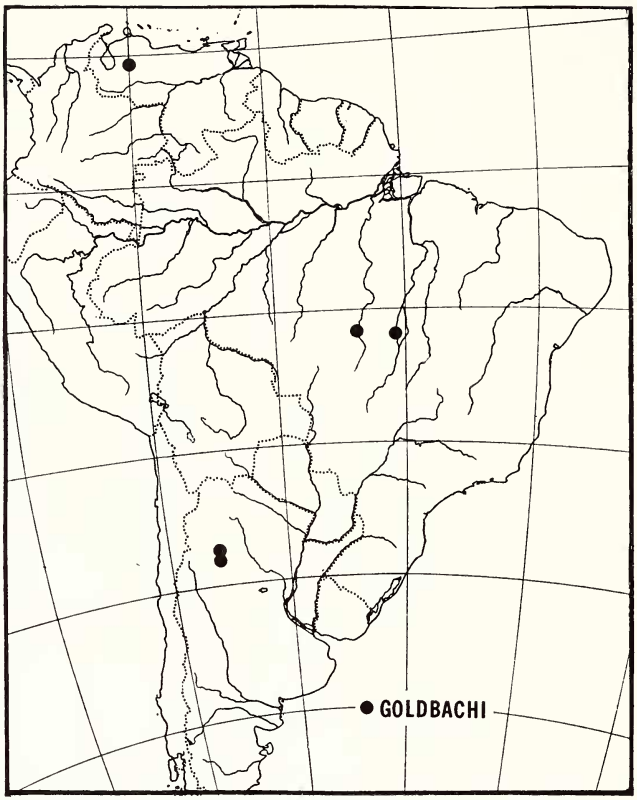


FIG. 76. Distribution of *Chaetarthria goldbachi*.

MALE [based on specimen, Río Cosquín, Cosquín, Córdoba, Argentina, November 28, 1971, Lee Herman (AMNH)]: Shape broadly oval, somewhat convex. Head black, punctation moderately coarse but rather sparse, lacking micropunctation between major punctures, labrum with many small punctures, vestiture very sparse. Pronotum, scutellum and elytra light brownish yellow with pronotal disc and elytral humeri darker, pronotum nearly impunctate, lacking micropunctation, with little vestiture, elytra rather thickly provided with shallow punctures not evidently serial, apex of each elytron with two slightly raised longitudinal areas, vestiture fairly thick but not very evident, sutural striae traceable for nearly three quarters of way from apex to base. Ventral surface black except palpi, antennae, prosternum and legs yellowish. Protibiae in anterior view widening

sharply from base for about half of length, then inner margin bent so sides roughly parallel to apex, about three and one half times as long as greatest width, medial face of apical portion with a series of flat, slanting plates close together, six on each protibia. Aedeagus in dorsal view with parameres elongate, parallel sided except slightly indented at sides about one third of way from apex, apex sharply truncate, inner margin of each paramere extending forward as a small nipple; penis not evident; basal piece elongate, evenly narrowing anteriorly; in lateral view basal piece fairly slender, concave ventrally, over one and one half times length of parameres if straightened out; parameres thin and scoop shaped.

FEMALE [based on specimen with data as male above (AMNH)]: Externally like male except slightly darker dorsally so that golden elytral vestiture slightly more evident against darker elytra, pronotum very lightly micropunctate between major punctures, and lacking secondary sexual modifications of protibiae.

VARIATION: There is considerable variation in the amount of brown in the dorsal color. Some specimens are quite brownish over the entire dorsum while others have at least the elytra lighter yellow but the humeri and scutellum dark, and still others are lighter yellow over the entire dorsum (except that the head is always black). In darker specimens the elytral vestiture is more evident against the darker background. Only a few specimens show any trace of micropunctation on the head and pronotum (referred to as reticulation in Balfour-Browne's original description). The shape of the membranous area between parameres and basal piece in Balfour-Browne's drawing of the aedeagus shows that this is a ventral view, not dorsal as labeled.

SPECIMENS EXAMINED: Total 22 males, 45 females. ARGENTINA: *Córdoba*: Cosquín, Río Cosquín, November. *La Rioja*: 5 km. E. of Chilecito, 1500 m., November. *Tucumán*: January. 7 km. W. of San Pedro de Colalao, December. *Province?*: Pampa Grande (♀ only). The female taken without males is only tentatively identified.

THE SPANGLERI GROUP

DIAGNOSIS: Dorsal surface yellow to nearly black, head black; protibiae of males elbowed or with rounded angle on inner margin (fig. 73), medial or posterior face of apical portion with two to five stalked discs (fig. 80); male metasternum without larger bristles; parameres, taken together, slightly to much longer than wide (fig. 74, etc.).

This group of five species occurs from southern California and Arizona to Brazil. It differs from the previous groups by the presence of discs on the male protibiae, and from the following group by lacking the larger bristles on the metasternum of the male.

Chaetarthria spangleri, new species
(Figures 73, 74, 75, 85)

DIAGNOSIS: The yellowish dorsum with no darkening of the pronotal disc and the fairly large size (elytral length generally over 1.45 mm.) distinguish this species through most of its range, that is from extreme southern Mexico through Honduras. In Costa Rica, however, the species apparently is brown dorsally (see variation), and that coloration plus the size should separate it from all other species in that area.

C. bicolor Sharp extends into the range of *spangleri* but is both darker and smaller, the EL generally being under 1.45 mm. in that area. Other yellowish species, *flava*, *veracruzensis*, and *pallida* are known from Mexico north of the known range of *spangleri*, so positive identifications should not be made without examination of male protibiae and aedeagus. The male protibia of *spangleri* has four or five discs, that of *flava* four discs, that of *veracruzensis* three discs, and that of *pallida* three plates.

This species is named for Dr. Paul Spangler, of the National Museum of Natural History, Washington. Dr. Spangler has collected many extensive series of *Chaetarthria*, particularly in Central America, adding greatly to the available material.

DISTRIBUTION: Southern Mexico (Guerrero) south to Costa Rica.

HOLOTYPE: Male, 5 mi. E. of Choluteca, Choluteca, Honduras, July 28, 1965, Paul J. Spangler (USNM). Shape oval, parallel sided at middle, somewhat convex. Head black, punctures shallow and rather sparse, no micropunctation between major punctures, labrum with many fine punctures, vestiture very sparse and fine. Pronotum, scutellum and elytra slightly brownish yellow, scutellum and elytral humeri slightly darker, pronotal punctation and vestiture very sparse and fine, no micropunctation, elytral vestiture slightly thicker and more evident, punctures coarser and more numerous, apex of each elytron with six very shallow, short, longitudinal grooves, the ones nearer the suture being longer, sutural striae traceable for nearly three quarters of way from apex to base. Ventral surface black except antennae, palpi, prosternum and legs yellowish. Protibiae in anterior view widening from base for about half of length, then inner margin bent so margins slightly convergent to apex, about three times as

long as greatest width, posterior face of apical portion with series of stalked discs set in groove just behind medial edge, five discs on each protibia. Aedeagus in dorsal view with each paramere elongate, narrow, with large apical spine; penis not visible; basal piece short, bulbous, broader than paramere bases; in lateral view basal piece short and thick with ventrally projecting shelf at anterior margin, slightly less than one and one half times length of parameres; parameres elongate, curved dorsally at tip, composed of an evenly curved ventral plate and flatter dorsal plate which has lateral spine near its tip. EL 1.59 mm., GW 1.23 mm., GH .72 mm., GW/EL .77, GH/EL .45, PL .28 mm.

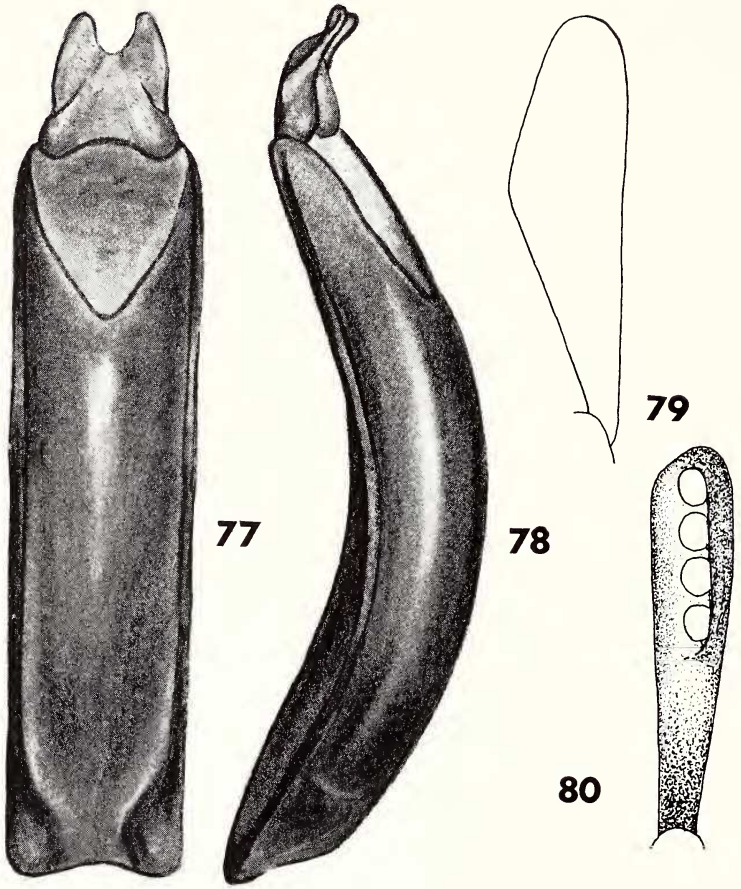
FEMALE [based on specimen with same data as holotype (USNM), no allotype designated]: Externally like male except lacking secondary sexual modifications of protibiae.

VARIATION: Presence of dark marking on the scutellum and elytral humeri and light grooving of the elytral apex are both somewhat variable characters. A series of one male and two females from Las Cañas, Guanacaste, Costa Rica, has the pronotum, scutellum and elytra brown.

PARATYPES AND FEMALES (total 18 males, paratypes, 28 females, not paratypes): COSTA RICA: *Guanacaste*: Las Cañas, 1 ♂, 2 ♀♀, July 13, 1965, Paul Spangler (USNM). GUATEMALA: *Izabel*: Los Amates, 1 ♂, 4 ♀♀, no date, Kellerman (MCZ). HONDURAS: *Choluteca*: 5 mi. E. of Choluteca, 3 ♂♂, 10 ♀♀, July 28, 1965, Paul J. Spangler (DM, USNM). Pespire, 1 ♂, July 29, 1965, Paul J. Spangler (USNM), 5 ♂♂, 3 ♀♀, August 1, 1967, O. S. Flint (DM, USNM). MEXICO: *Chiapas*: 7.2 mi. SE. of Chiapa de Corzo, 1 ♂, July 8, 1971, Clark, Murray, Hart, Schaffner (TAM). Near Pijijiapan, 1 ♂, 1 ♀, July 5, 1965, Paul J. Spangler (USNM). 2 mi. SW. of Las Cruces, 1 ♂, August 3, 1954, A. A. Alcorn (KU). *Guerrero*: Pie de la Cuesta, 1 ♂, 1 ♀, July 9, 1955, R. B. Selander (CA). *Oaxaca*: Tehuantepec, 1 ♂, 3 ♀♀, July 23, 1964, Paul J. Spangler (USNM). 9 mi. W. of Tehuantepec, 2 ♂♂, 2 ♀♀, June 25, 1965, Burke, Meyer, Schaffner (TAM). *Puebla*: Amatitlan, December (♀ only). The female not accompanied by a male is only tentatively identified.

Chaetarthria magna, new species
(Figures 77, 78, 79, 80, 86)

DIAGNOSIS: The reddish brown to nearly black dorsal color and large size (elytral length usually over 1.8 mm.) will separate this species from all others in southern California and Arizona to northern



FIGS. 77–80. Fig. 77. *Chaetarthria magna*, aedeagus, dorsal. Fig. 78. same, lateral. Fig. 79. left protibia, anterior face. Fig. 80. same, medial face.

Mexico, except for large specimens of *hespera*. This latter species has plates on the male protibiae whereas *magna* has discs. *C. major*, from southern Mexico and Central America, is also large and dark but it has only two discs on the male protibia whereas *magna* has four, and *major* has the male protibiae bent on the inner margin much closer to the apex.

DISTRIBUTION: Southern California and Arizona to northern Mexico.

HOLOTYPE: Male, Camp Pendleton, Oceanside, San Diego County, California, October 25, 1945, H. P. Chandler (CA). Shape broadly oval, moderately convex. Head black, glabrous, punctation extremely fine and sparse, no micropunctation, labrum with many fine punctures. Pronotum, scutellum and elytra dark reddish brown except narrowly paler at sides of pronotum and tip of elytra, pale area extending narrowly anteriorly along sides of elytra, pronotum with only a few fine punctures and a few fine hairs, lacking micropunctation, elytra with vaguely regular rows of punctures, vestiture fine but fairly thick, apex lacking grooves or raised areas, sutural striae traceable nearly three quarters of way from apex to base. Ventral surface black except palpi, antennae, prosternum, legs and sides of abdomen yellowish brown, metacoxae and triangular area of metasternum anterior to each coxa reddish brown. Protibiae in anterior view widening sharply for slightly over half of distance from base, then inner margin bent so sides slightly convergent to apex, about three and one third times as long as greatest width, medial face of apical portion with series of stalked discs set in longitudinal depression just behind anterior edge, four discs on each protibia. Aedeagus in dorsal view with each paramere a small irregular rectangle with large curved tooth at the tip; penis elongate, slender, pointed at tip, visible below and between paramere tips; basal piece long, parallel sided; in lateral view basal piece concave ventrally, with narrow longitudinal flange at each side along ventral margin, nearly five times length of parameres; parameres slender, joined to basal piece at nearly right angle; penis extending below parameres, slender, turned up at tip. EL 1.89 mm., GW 1.49 mm., GH .82 mm., GW/EL .79, GH/EL .44, PL .18 mm.

FEMALE [based on specimen with same data as holotype except collected on October 12, 1945 (CA), no allotype designated]: Externally like male except lacking secondary sexual modifications of protibiae.

VARIATION: Dorsal color varies from a rather light reddish brown to nearly black, the specimens from Baja California Sur being especially dark. The apical pale area of the elytra is variable in extent and clarity but often is clearly marked and covers about the apical eighth of the elytra.

PARATYPES AND FEMALES (total 47 ♂♂, paratypes, 38 ♀♀, not paratypes): MEXICO: *Baja California Sur*: 3 mi. NW. of Miraflores, Canyon San Bernardino, Boca de la Sierra, 1 ♂, 4 ♀♀, January 19, 1959, H. B. Leech (CA). 9 mi. up Canyon San Bernardino from Boca de la Sierra (Potrero), ca. 1500′, 8 ♂♂, 7 ♀♀, August 2, 1971,

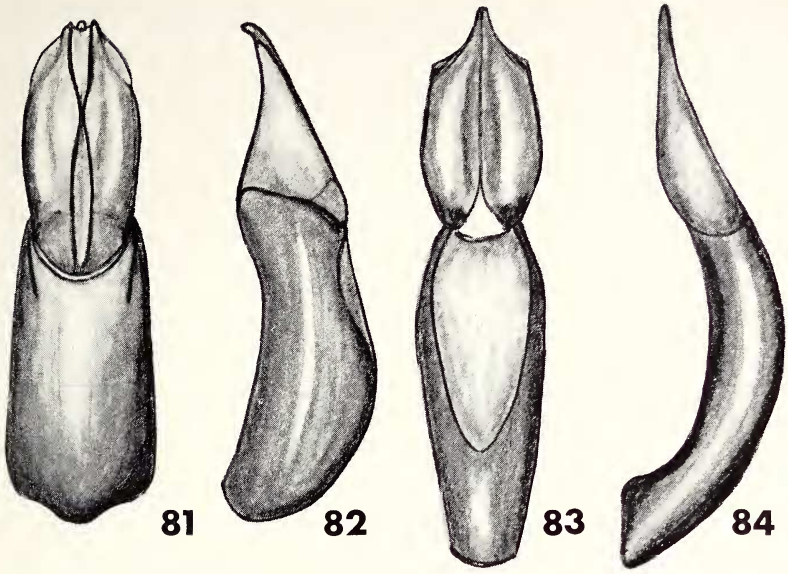
H. G. Real, R. E. Main (CA, DM). *Chihuahua*: 3 mi. W. of Parrita, Santa Clara Canyon, September (♀ only). *Sonora*: Alamos, 2 ♂♂, August 12, 1960, P. H. Arnaud Jr., E. S. Ross, D. C. Rentz (CA). 30 mi. E. of Ures, August (black light) (♀ only). UNITED STATES: *Arizona*: COCHISE CO.: Ramsay Canyon, Huachuca Mountains, March (♀ only). PINAL CO.: Aravaipa Canyon, May (♀ only). Riverside, 2 ♂♂ (AMNH, CA). Superior, July (♀ only). *California*: No further data, 2 ♂♂ (CNHM, MCZ). Southern California, 1 ♂, 1 ♀ (INHS). LOS ANGELES CO.: No further locality, 1 ♂, F. E. Blaisdell (CA), 5 ♂♂, 6 ♀♀, Coquilette (DM, USNM). Los Angeles (♀ only). Pasadena (♀ only). San Fernando, 1 ♂, 1 ♀, April, 1920, F. Winters (RBM). ORANGE CO.: No further locality, 1 ♂, April 11, 1917, J. O. Martin (CA). RIVERSIDE CO.: Riverside, 6 ♂♂, 4 ♀♀, F. E. Winters (CA, DM). San Jacinto Mountains, 1 ♂, F. E. Winters (CA). SAN BERNARDINO CO.: No further data, 2 ♂♂, 1 ♀ (AMNH). San Bernardino, 1 ♂ (MCZ), 3 ♂♂, 1 ♀, August, 1915 (CA), 1 ♂, 1 ♀, August, 1918, Ulke (CA). SAN DIEGO CO.: Oceanside, Camp Pendleton, 6 ♂♂, 2 ♀♀, October 1 to 26, 1945, H. P. Chandler (CA, DM, UCB). SAN JOAQUIN CO.: Mendota, 1 ♂, April 1 (CA). COUNTRY ?: "Wick." (Wickham?), 1 ♂ (MSU). Females not associated with males are only tentatively identified.

Chaetarthria flava, new species
(Figures 81, 82, 85)

DIAGNOSIS: This species is known only from Sonora and Sinaloa, Mexico, and in that area there are only two other dorsally yellowish species, *C. bicolor* (which has been taken with *flava* in both areas where *flava* is certainly known) and *pallida* which has only rarely been collected in Mexico. Both of these species are often marked or shaded with brown on the pronotum, whereas *flava* is more yellowish and never shaded with brown. Also, *flava* averages larger (elytral length usually 1.4 to 1.7 mm. compared with usually 1.3 to 1.5 mm. for the other two species in that area). See also *C. veracruzensis* and *spangleri*, which occur much further south.

DISTRIBUTION: Sonora and Sinaloa, Mexico.

HOLOTYPE: Male, Alamos, Sonora, Mexico, August 12, 1960, P. H. Arnaud Jr., E. S. Ross, D. C. Rentz (CA). Shape oval, somewhat convex. Head black, punctures shallow, coarse, fairly numerous, no micropunctation, labrum with many fine punctures, vestiture very fine and sparse. Pronotum, scutellum and elytra yellow, pronotum with sparse, fine vestiture and sparse, shallow punctures, no micro-



FIGS. 81–84. Fig. 81. *Chaetarthria flava*, aedeagus, dorsal. Fig. 82. same, lateral. Fig. 83. *C. veracruzensis*, aedeagus, dorsal. Fig. 84. same, lateral.

punctation, elytral vestiture and punctation thicker, punctures quite coarse and shallow, apex of each elytron with two very slightly raised longitudinal areas, sutural striae traceable nearly three quarters of way from apex to base. Ventral surface blackish brown except palpi, antennae, prosternum and legs yellow, sides of abdomen paler brown. Protibiae in anterior view widening from base for about two thirds of length, then inner margin bent so sides slightly convergent to apex, about three and one third times as long as greatest width, medial face of apical portion with series of stalked discs set in groove just behind anterior edge, four discs on each protibia. Aedeagus in dorsal view with each paramere an elongate rectangle with its outer margin slightly bowed, tip bluntly rounded and drawn out slightly at medial margin; penis fairly broadly visible between paramere tips, pointed at tip; basal piece elongate, slightly broader than parameres at junction with them and broadening slightly from there anteriorly; in lateral view basal piece fairly thick, slightly concave ventrally, about one and one third times length of parameres; paramere a slightly elongate triangle turned down at tip. EL 1.40 mm., GW 1.16 mm., GH .58 mm., GW/EL .83, GH/EL .41, PL .25 mm.

FIG. 85. Distribution of *Chaetarthria flava* and *C. spangleri.*

FEMALE [based on specimen with same data as holotype (CA), no allotype designated]: Externally like male except lacking secondary sexual modifications of protibiae.

VARIATION: Only minor variations in color, punctation and vestiture have been noted.

PARATYPES AND FEMALES (total 43 ♂♂, paratypes, 32 ♀♀, not paratypes). MEXICO: *Sinaloa*: Mazatlan, May (brackish pools) (♀ only). 21 to 30 mi. E. of Villa Unión, 16 ♂♂, 13 ♀♀, July 7 and 25, 1964, J. A. Chemsak, J. Powell, H. F. Howden (some at black and white lights) (CNC, DM, UCB). *Sonora*: 27 ♂♂, 14 ♀♀, data as holotype (CA, DM). 10 mi. W. of Alamos, July (♀ only). Females not associated with males are only tentatively identified.

Chaetarthria veracruzensis, new species
(Figures 83, 84, 86)

DIAGNOSIS: The yellowish dorsum and distribution in southern Mexico separate this species from all but *C. spangleri*, *bicolor* and *pallida.* The male protibiae, with three discs, and the aedeagus are diagnostic but females are more difficult to separate. Both *bicolor* and *pallida* average very slightly smaller (elytral length usually 1.5 to 1.6 mm. for *veracruzensis* females and usually under 1.5 mm. for

FIG. 86. Distribution of *Chaetarthria magna* and *C. veracruzensis*.

the females of the other two species in Mexico), but they are similar to *veracruzensis* in being brownish yellow. *C. spangleri* is about the same size as *veracruzensis* but averages more yellow, less brownish. See also *C. flava* which occurs well north and west of Veracruz.

DISTRIBUTION: Only Veracruz State, Mexico, near the coast.

HOLOTYPE: Male, 25 mi. S. of Acayucan, Veracruz, Mexico, July 4, 1965, Paul J. Spangler (USNM). Shape oval, somewhat parallel sided at middle, somewhat convex. Head black, coarsely and fairly thickly and evenly punctate except labrum with many fine punctures, no micropunctation between major punctures, vestiture fine and sparse. Pronotum, scutellum and elytra slightly brownish yellow, scutellum and elytral humeri darker, pronotal punctation irregular, fairly coarse and thick, no micropunctation, vestiture fine and sparse, elytral punctation coarser, vaguely regular, vestiture thicker, apex of each elytron with three light, short longitudinal grooves, sutural striae traceable nearly three quarters of way from apex to base. Ventral surface blackish brown except palpi, antennae,

prosternum, legs and sides of abdomen paler. Protibiae in anterior view with margins diverging sharply from base for about three fifths of length, then medial margin bent so sides slightly convergent to apex, medial face of apical portion with series of stalked discs set in groove just behind anterior edge, three discs on each protibia. Aedeagus in dorsal view with each paramere a rectangle with outer margin slightly bowed, apex with short tooth laterally and longer one medially, medial tooth pointing somewhat dorsally; penis slender, pointed, visible above tips of parameres; basal piece elongate, roughly parallel sided; in lateral view basal piece concave ventrally, nearly twice length of parameres if straightened out; paramere an elongate triangle; penis curving just dorsal to paramere tips. EL 1.49 mm., GW 1.23 mm., GH .67 mm., GW/EL .82, GH/EL .45, PL .23 mm.

FEMALE [based on specimen with same data as holotype (USNM), no allotype designated]: Externally like male except lacking secondary sexual modifications of protibiae.

VARIATION: No appreciable variation noted.

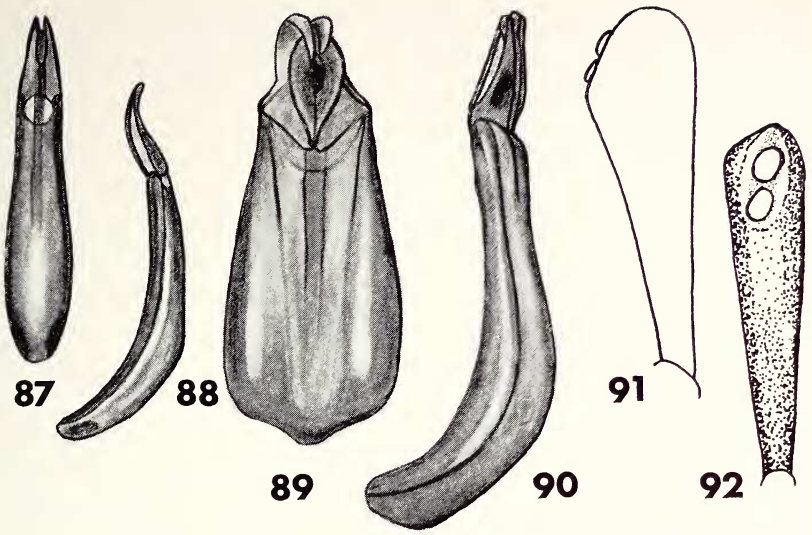
PARATYPES AND FEMALES (total 2 ♂♂, paratypes, 1 ♀, not paratype). MEXICO: *Veracruz*: 25 mi. S. of Acayucan, 1 ♂, 1 ♀, data as holotype (DM). 4 mi. E. of Coatzocoalcos, 1 ♂, August 20, 1967, H. R. Burke (black light) (TAM).

Chaetarthria granulata, new species
(Figures 87, 88, 93)

DIAGNOSIS: The small size (elytral length generally .95 to 1.15 mm.), dark dorsal color with evident, broad, regularly arranged hairs on the elytra, and strong micropunctation of the head and pronotum giving those areas a very dull, granulate appearance, make this species rather distinctive. The elytra are usually brownish, the pronotum black discally and brown at the margins and the head black, the elytral apex is lightly grooved and the elytra often taper somewhat posteriorly from the humeri.

DISTRIBUTION: Only known from the state of Matto Grosso, Brazil.

HOLOTYPE: Male, Jacare, Xingu National Park, Matto Grosso, Brazil, November 1965, Alvarenga and Werner (CNHM). Shape oval, sides straight at middle but slightly convergent from elytral humeri to posterior so beetle widest at humeri, fairly convex. Head black, vestiture fine, labrum with many fine punctures, remainder of head without major punctures but with evident micropunctation giving surface dull, granular look. Pronotum, scutellum and elytra reddish brown except pronotal disc and scutellum blackish, pronotum and scutellum lacking major punctures but strongly micropunctate like



FIGS. 87–92. Fig. 87. *Chaetarthria granulata*, aedeagus, dorsal. Fig. 88. same, lateral. Fig. 89. *C. major*, aedeagus, dorsal. Fig. 90. same, lateral. Fig. 91. same, left protibia, anterior face. Fig. 92. same, medial face.

head, dull and granular looking, vestiture very evident, composed of coarse hairs nearly half as broad as long, irregularly arranged on pronotum but in definite longitudinal rows on elytra, apex of each elytron with three fairly strongly raised longitudinal areas giving apex lightly grooved appearance, sutural striae traceable more than three quarters of way from apex to base. Ventral surface dark reddish brown except palpi, antennae, prosternum, legs and sides of abdomen lighter brown. Protibiae in anterior view widening from base for about three fourths of length, then medial margin curved gradually so sides nearly parallel to apex, about three times as long as greatest width, medial face of apical portion bearing two small stalked discs close together. Aedeagus in dorsal view with parameres together forming an elongate triangle with apex posterior; penis tip broadly visible between paramere tips; basal piece long, nearly parallel sided, widest at middle; in lateral view basal piece somewhat concave ventrally, nearly four times length of parameres; parameres a slender, elongate triangle slightly turned up at tip. EL .98 mm., GW .77 mm., GH .49 mm., GW/EL .79, GH/EL .50, PL .09 mm.

ALLOTYPE: Female with same data as holotype (CNHM). Ex-

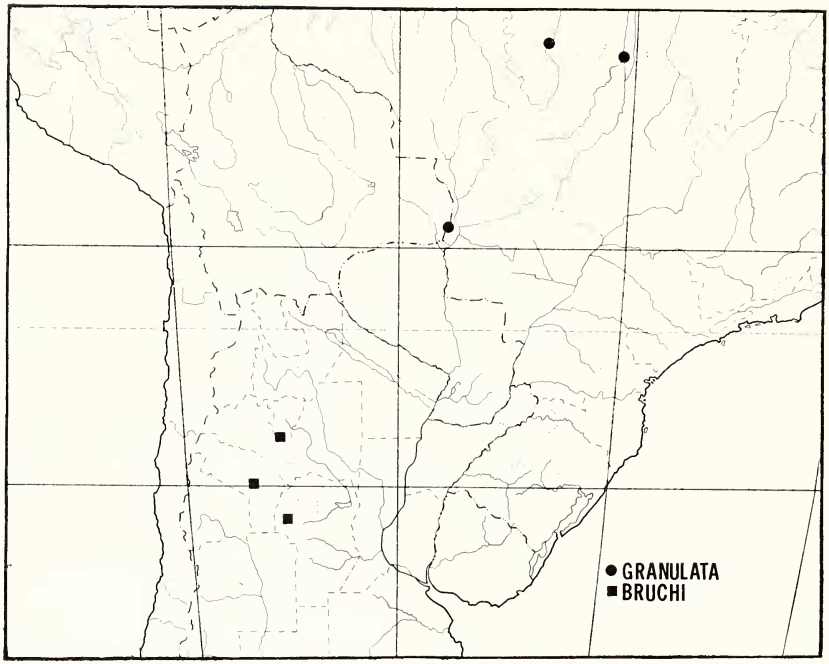


FIG. 93. Distribution of *Chaetarthria bruchi* and *C. granulata.*

ternally like holotype except lacking secondary sexual modifications of protibiae. EL 1.00 mm., GW .79 mm., GH .51 mm., GW/EL .79, GH/EL .49.

VARIATION: The micropunctation of the head and pronotum sometimes extends to the anterior of the elytra making them also appear dull. The abdomen and elytra are most often reddish brown, sometimes black while the labrum and scutellum are most often black but sometimes reddish brown.

PARATYPES (total 41 ♂♂, 36 ♀♀, 50 not sexed): BRAZIL: *Matto Grosso*: Corumba, 19 ♂♂, 9 ♀♀, 50 not sexed (DM, RBM). Jacare, Xingu National Park, 23 ♂♂, 24 ♀♀, November 1965, Alvarenga and Werner (CNHM, IU, UMMZ, USNM). Santa Isabel, Matto Grosso side of Rio Araguaia, 3 ♀♀, August 12 to 22, 1957, Borys Malkin (CA, DM).

THE BICOLOR GROUP

DIAGNOSIS: Head black, remainder of dorsum yellow to black; protibiae of male elbowed or sinuate on inner margin (figs. 91, 100),

inner face of apical portion with one or two stalked discs (figs. 92, 99); male metasternum with two longitudinal rows of larger bristles in posterior quarter (difficult to see without good lighting and high magnification); parameres together longer than wide (figs. 89, 95, etc.).

This group of five species occurs from central California south to Costa Rica and east to Utah. Within the group, *C. bicolor* and *ochra* appear closely related as shown by their wing shaped parameres, and *punctulata* and *utahensis* appear closely related because of the asymmetry of their parameres.

Chaetarthria major, new species
(Figures 89, 90, 91, 92, 94)

DIAGNOSIS: This is the only large (elytral length generally over 1.6 mm.), dark colored species known from southern Mexico and Central America, but its range nearly overlaps that of *C. magna*, which it greatly resembles, in central Mexico. Determinations of material from that area should be made only after examination of the male protibiae (with two stalked discs in *major*, four in *magna*) or aedeagus. See also the variation in *C. spangleri*.

DISTRIBUTION: Central Mexico (Sinaloa) to Honduras.

HOLOTYPE: Male, from 21 miles East of Villa Unión, Sinaloa, Mexico, July 25, 1964, 300′, black and white light, J. A. Chemsak and J. Powell (UCB, deposited in CA). Shape broadly oval, parallel sided at middle, fairly convex. Head black, punctation fairly coarse and thick except labrum with many fine punctures, no micropunctation between major punctures, no apparent vestiture. Pronotum, scutellum and elytra shining dark reddish brown, indefinitely paler at elytral apex and sides of pronotum, pronotal punctation sparse, mostly fine, no micropunctation between major punctures, vestiture a few scattered hairs, elytral punctation coarser and thicker, not very regular, vestiture not very evident, of fine hairs in fairly regular longitudinal rows, apex without grooves or raised areas, sutural striae traceable over three-quarters of way from apex to base. Ventral surface black except palpi, antennae, prosternum, legs and apical half of abdomen brownish yellow, metasternum with row of yellowish bristles, larger than surrounding vestiture, in posterior quarter on each side of flat medial area. Protibiae in anterior view widening from base for about four-fifths of length, then medial margin gradually curved so sides converging towards apex, about three times as long as greatest width, medial face of apical portion with two stalked discs on each protibia. Aedeagus in dorsal view with each paramere a

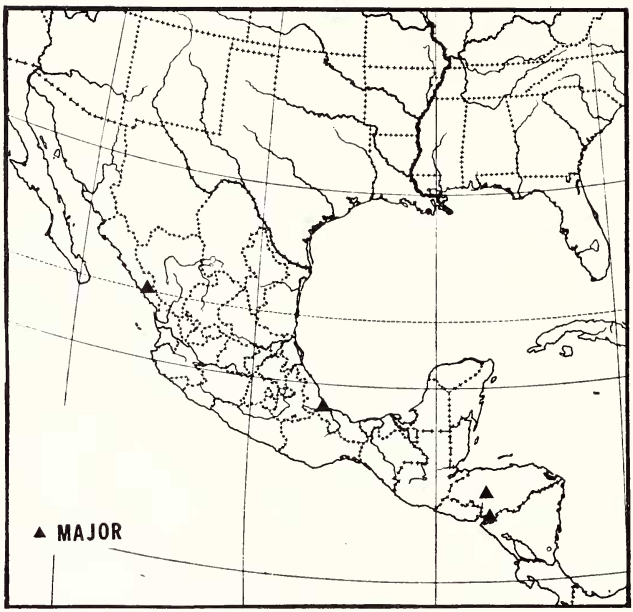


FIG. 94. Distribution of *Chaetarthria major*.

small, finger-like lobe, twisted so margin which is medial at base curves dorsolaterally to lie along outside edge of paramere at tip; penis not visible; basal piece elongate, widest about two-thirds of way from junction with parameres; in lateral view basal piece thin, strongly concave ventrally, over four times length of parameres if straightened out; paramere roughly an elongate triangle. EL 1.80 mm., GW 1.40 mm., GH .80 mm., GW/EL .78, GH/EL .45, PL .12 mm.

FEMALE [based on specimen with same data as holotype (CA), no allotype designated]: Externally like male except lacking secondary sexual modifications of protibiae and metasternum.

VARIATION: Dorsal color runs from dark reddish brown to almost black.

PARATYPES AND FEMALES (total 5 ♂♂, paratypes, 9 ♀♀, not paratypes): HONDURAS: *Choluteca*: 5 mi. E. of Choluteca, 1 ♂, July 28, 1965, Paul J. Spangler (USNM). *Comayagua*: Río Humuya, 1 ♂, August 3, 1967 (USNM). MEXICO: *Chiapas*: Near Pijijiapan, 1 ♀, July. *Oaxaca*: Tehuantepec, 1 ♀, July. *Sinaloa*: Data as holotype, 1 ♂, 7 ♀♀ (♂ DM). Data as holotype but H. F. Howden, 2 ♂♂, 3 ♀♀ (CNC). *Veracruz*: Puente Nacional, 2 ♂♂,

July 31, 1966, Flint and Ortiz (DM, USNM). Females not associated with males are only tentatively identified.

Chaetarthria bicolor Sharp

(Figures 95, 96, 97, 98, 99, 100, 101, 106)

Chaetarthria bicolor Sharp, 1882, p. 87. Type locality: near Guatemala City, Guatemala. Type male in British Museum (Natural History). Not examined by me for this study. d'Orchymont, 1939, pp. 3, 4–5. Balfour-Browne, 1939, p. 299. Leech, 1948, pp. 445–446 (cited as "species near *bicolor*").

Chaetarthria bicolor mexicana Balfour-Browne, 1939, pp. 299–300. No type material originally designated; lectotype, from Sierra de Durango, Mexico (RBM), and paralectotype, from Veracruz, Mexico (RBM), designated herein and examined by me for this study. **NEW SYNONYMY.**

DIAGNOSIS: The extensive range and great geographic variability of this species make it impossible to give diagnostic characters which will work in all parts of the range; the only completely consistent character appears to be the male protibia with its slightly sinuate inner margin and single stalked disc near the tip. The wing-like parameres are very similar to those of *C. ochra* but always larger than those of that species (note also that the parameres of *bicolor* are geographically variable).

The northern populations of *bicolor*, around the San Francisco Bay area, are easily recognized by the dark brown to black dorsum with a narrow, clearly defined pale border on the pronotum and elytra and strong longitudinal grooves on the elytral apex (but see also *C. nigrella*). South of this area, as the beetle becomes brownish and finally yellowish from southern California south and east, females are difficult to separate from related species. In these areas *bicolor* averages smaller (elytral length generally under 1.6 mm.) than any other yellowish species except *C. pallida*. *C. bicolor* is generally somewhat brownish yellow, often with brown markings, whereas *C. ochra* averages larger (elytral length generally over 1.6 mm.) and paler yellow and is never marked with brown except on the scutellum and humeri. *C. pallida* often has the pronotum nearly all dark brown to blackish when the elytra are yellowish, while *bicolor* usually has the pronotum and elytra similar in color. Occasional specimens of *bicolor*, however, have the pronotum dark brown with the elytra considerably lighter yellowish brown.

C. spangleri, *veracruzensis*, and *flava* are rarer species sympatric with the southern group of *bicolor* but all average larger (elytral length generally over 1.35 mm.) and more yellowish.

DISTRIBUTION: California west of the Sierra Nevada Mountains from Mendocino County south to Costa Rica, and extending east from southern California to central Texas (McCulloch County).

MALE [based on specimen from Lake Ilopango, La Libertad, El Salvador, August 2, 1965, Paul J. Spangler (USNM)]: Shape oval, somewhat parallel sided at middle, moderately convex. Head black, punctation coarse, irregular, fairly thick, no micropunctation between major punctures, labrum with many fine punctures, vestiture very sparse and fine. Pronotum, scutellum and elytra brownish yellow, pronotal punctation coarse, sparse, shallow, no micropunctation between major punctures, vestiture a few scattered fine hairs, elytral punctation and vestiture thicker, vaguely serial at sides and apex, apex with five short, shallow, longitudinal grooves on each elytron in addition to sutural stria; sutural striae traceable nearly three quarters of way from apex to base. Ventral surface black except palpi, antennae, prosternum and legs brownish yellow, metasternum with row of yellowish bristles, larger than surrounding vestiture, in posterior quarter on either side of flat medial area. Protibiae in anterior view with outer margin straight, medial margin very slightly sinuate with slight bulge near apex, about three and two-thirds times as long as greatest width, medial face with single small stalked disc near apex, behind apical bulge. Aedeagus in dorsal view with parameres each a right triangle about twice as long as greatest width, inner apical corner acute, slightly attenuate, outer apical corner rounded; penis visible between parameres as long triangle; basal piece elongate, parallel sided except joined to parameres by narrow neck; in lateral view basal piece slender, slightly concave ventrally, nearly two and a third times length of parameres; parameres very thin and straight.

FEMALE [based on specimen with same data as male above (USNM)]: Externally like male except sides of abdomen paler and lacking secondary sexual modifications of metasternum and protibiae.

VARIATION: There is variation within populations for the amount of brown in the basic color of the pronotum and elytra, in the presence of brown markings on the pronotal disc and elytral humeri, and in the presence of paler sides on the abdominal sternites. The penis is apparently capable of extension or retraction so that its length relative to that of the parameres appears quite variable.

This species as considered here includes three distinct groups of populations. They would appear to match the concept of subspecies but I have not used formal trinomials to designate them. The northern and central groups appear to interbreed in a broad area south of San Francisco, California, as specimens from that area are variable and

intermediate between the northern and central groups in color, elytral grooving and aedeagal characters; see further discussion under the central group.

The aedeagus of *C. ochra* could be considered to fit within the variation of *bicolor* but it is treated as a separate species because its geographic distribution overlaps that of *bicolor* and it differs slightly from that species in male protibiae, size and color (see diagnosis).

Southern group: Extends from Costa Rica to northern Mexico and northeast to central Texas (McCulloch Co.). Both the locality (near Guatemala City) and Balfour-Browne's drawing of the aedeagus (1939, p. 299) of the holotype of *bicolor* place it in this group but I have not seen the specimen. d'Orchymont (1939) illustrated the aedeagus of a specimen from Sierra de Durango (probably the Sierra Madre Occidental within the State of Durango, according to Selander and Vaurie 1962, p. 57) and mentioned another male from Veracruz, Mexico, identifying both specimens as *bicolor*. Balfour-Browne (1939) wrote that d'Orchymont's illustration showed significant difference from Sharp's type of *bicolor* and named the subspecies *bicolor mexicana* based on d'Orchymont's specimens. I have seen both of d'Orchymont's male specimens and they fit within the southern group as here defined. Thus I designate the Sierra de Durango male as lectotype and the Veracruz male as paralectotype for *bicolor mexicana* and reduce that subspecies to a synonym of *bicolor*. I have also examined the male from near Miraflores, Baja California Sur, Mexico, cited as "species near *bicolor*" by Leech (1948, pp. 445–446) and it belongs to this group.

The southern group is characterized by: pronotum and elytra brown to brownish yellow, pronotal disc and elytral humeri sometimes clouded with darker brown; elytral apex often grooved but never as deeply as in the northern group; parameres nearly truncate at apex, not strongly produced laterally, basal piece with fairly broad neck joining to parameres and in lateral view only slightly humped anterior to parameres.

There is also geographic variation within this group, with the more southern populations (Costa Rica, El Salvador) averaging darker brown dorsally and having the parameres somewhat more elongate with the lateral edges more produced apically (but not so much as in the central group). In darker specimens the elytral pubescence is evident as vaguely regular rows of whitish scales shining against the dark background.

No apparent hybrids have been found between this group and the

central one. I have labeled specimens of the southern group "So." in collections.

Central group: Extends from extreme southern California and northern Sonora east to central Arizona and north to a zone of apparent hybridization with the northern group in central California (see map, Figure 106).

Characterized by: pronotum and elytra brownish yellow, pronotal disc and elytral humeri often clouded with brown, elytral apex often weakly grooved but very seldom strongly so; lateral apical corners of parameres strongly produced to form a rounded lobe, so entire apex of aedeagus roughly U-shaped, basal piece constricted to a narrow neck joining parameres and in lateral view with dorsal hump just before this junction and a ventral median longitudinal keel extending to this junction; parameres in lateral view approximately continuing straight line of ventral margin of basal piece.

Hybrids with the southern group are unknown but a broad band of apparent hybridization with the northern group exists in central California. Specimens from that area are variably dark brown dorsally with a variably definite pale margin and usually a lightly grooved elytral apex; often the parameres are somewhat apically produced at their lateral margins. The aedeagus is usually more like that of the northern group. In collections, I have labeled specimens of the central group "Cent." and specimens from apparent hybrid populations "No. × Cent."

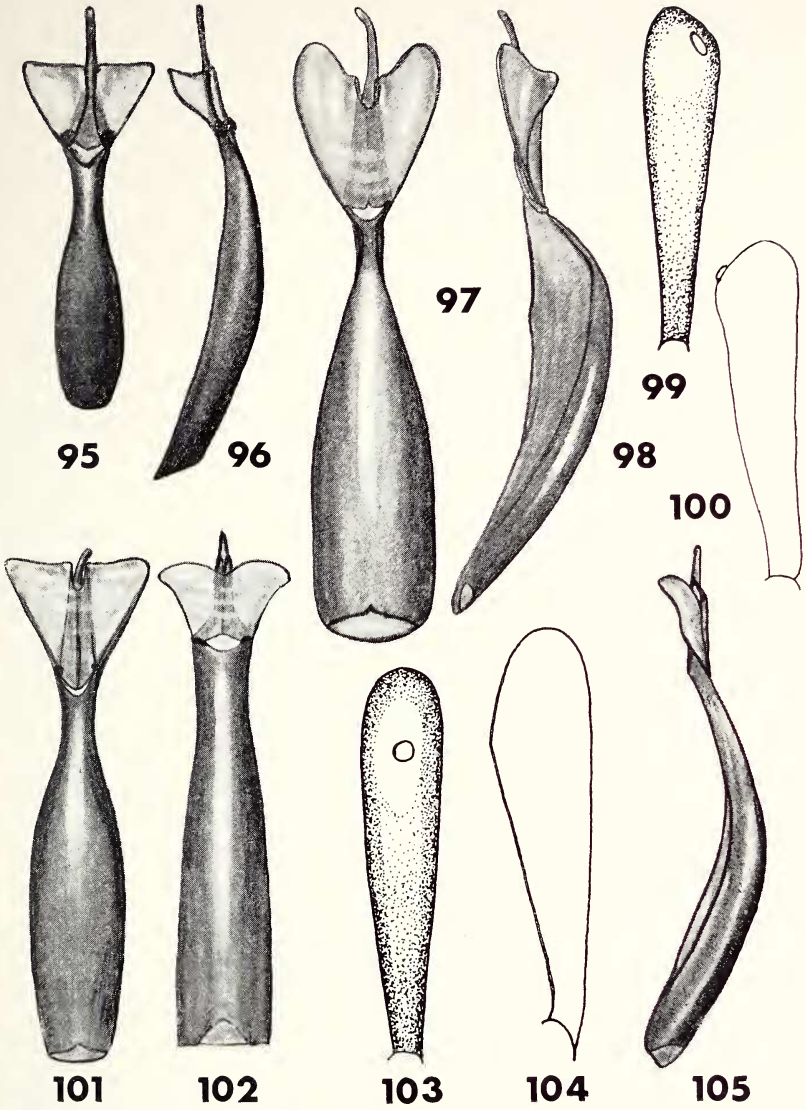
Northern group: Occurs only around the San Francisco Bay area of California.

Characterized by: pronotum and elytra dark brown to black except for sharply defined, narrow pale margin; elytral apex strongly longitudinally grooved; paramere tips not produced apically, apex nearly truncate, basal piece joining parameres by fairly broad neck and in lateral view not strongly humped dorsally on portion basad of parameres, parameres in lateral view approximately continuing curved line of dorsal margin of basal piece.

The broad zone of hybridization of the northern and central groups is discussed under the central group. I have labeled specimens of the northern group "No." in collections.

SPECIMENS EXAMINED: Southern group, 113 males, 105 females 98 not sexed. Central group, 109 males, 123 females. Central × Northern hybrid populations, 19 males, 14 females. Northern group, 19 males, 32 females.

Southern Group: COSTA RICA: *Guanacaste*: Las Cañas, July.



FIGS. 95–105. Fig. 95. *Chaetarthria bicolor*, northern group, aedeagus, dorsal. Fig. 96. same, lateral. Fig. 97. *C. bicolor*, central group, aedeagus, dorsal. Fig. 98. same, lateral. Fig. 99. same, left protibia, anterior face. Fig. 100. same, medial face. Fig. 101. *C. bicolor*, southern group, aedeagus, dorsal. Fig. 102. *C. ochra*, aedeagus, dorsal. Fig. 103. same, left protibia, medial face. Fig. 104. same, anterior face. Fig. 105. same, aedeagus, lateral.

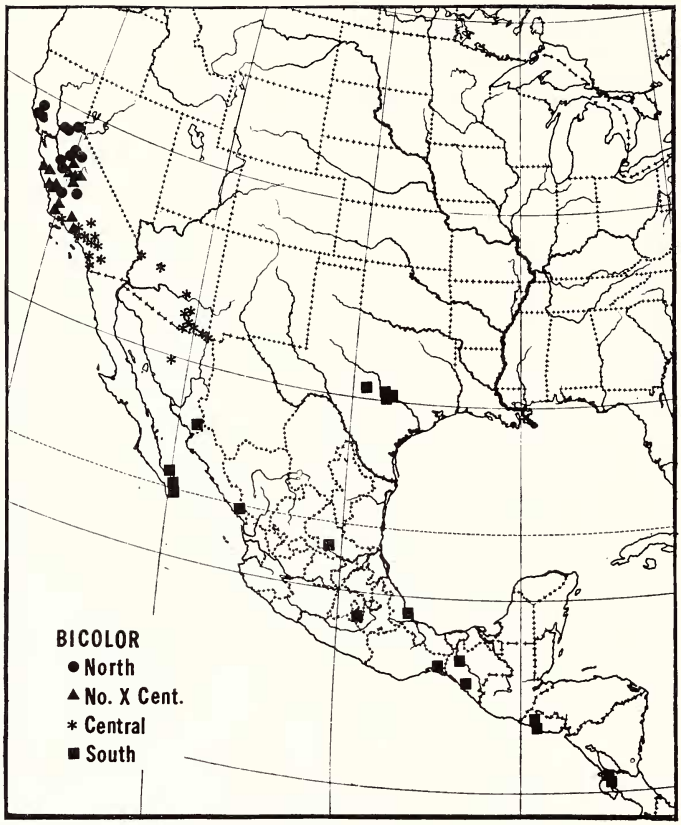


FIG. 106. Distribution of *Chaetarthria bicolor*.

8 mi. SE. Liberia, July. 10 mi. NW. Liberia, July. 12 mi. SW. Liberia, July. EL SALVADOR: *La Libertad*: Lake Ilopango, August. Río Majagual near La Libertad, July. MEXICO: *Baja California Sur*: 2 mi. and 10 mi. NE. of Cabo San Lucas, on highway Sur No. 19, January (light). E. of La Paz, Arroyo Saltito near Las Cruces, January. 12.4 mi. E. of La Paz on road to Las Cruces, Arroyo Agua de Los Posos, January. 3 mi. NW. of Miraflores, Cañon San Bernardino, Boca de la Sierra, January. 5 mi. S. Miraflores, July. *Chiapas*: 2 mi. N. of Ocozocoautla, August (black light). Near Pijijiapan, July. *Durango*: Sierra de Durango (Sierra Madre Occidental). *Mexico*: Tejupilco, Temescaltepec, June. *Oaxaca*: Zanatepec, July. *San Luis Potosi*: 2 mi. S. San Luis Potosi,

November (♀ only). *Sinaloa*: 21 mi. E. of Villa Unión, 300′, July. 27 mi. E. of Villa Unión, July. 28 mi. E. of Villa Unión, August. *Sonora*: Alamos, February, August. *Veracruz*: Veracruz. UNITED STATES: *Texas*: BLANCO CO.: Cypress Mill, September. BREWSTER CO.: Lajitas, May (♀ only). GILLESPIE CO.: Lange's Mill, June. LLANO CO.: 2 mi. S. of Buchanan Dam, September. Enchanted Rock, April. MCCULLOCH CO.: 16 mi. S. Brady, on San Saba River, June.

Central Group: MEXICO: *Sonora*: 30 mi. E. of Ures, August (black light). UNITED STATES: *Arizona*: COCHISE CO.: Ash Canyon, July. Douglas, September (♀ only). Guadelupe Canyon, 4200′, June, August (♀ only). MARICOPA CO.: Wickenberg, August (light trap). PIMA CO.: Bear Canyon, Santa Catalina Mountains, August. Molino Basin, August (♀ only). Sabino Canyon, June. Tucson, June, August. Palo Verde Campground, Tucson, September (black light). PINAL CO.: Superior, Boyce Thompson Arboretum, July, August, September (light trap). SANTA CRUZ CO.: Madera Canyon, Santa Rita Mountains, August (light trap). Nogales, August. YUMA CO.: Bill Williams Fork, August. COUNTY ?: Catalina Springs. *California*: LOS ANGELES CO.: Azusa, May. Los Angeles, September. Pasadena, February, June. Pico, February (♀ only). Pomona. Rincon, San Gabriel River Station, 1800′, September. Saugus, August. RIVERSIDE CO.: Cleveland National Forest, Dripping Springs Camp, Arroyo Seco Creek, July (♀ only). Palm Springs, April, May. Riverside. Riverside, Lower Sonorian Region. SAN BERNARDINO CO.: Hesperia, June. Victorville, February. SAN DIEGO CO.: El Monte, April (♀ only). Green Valley Falls, April. Mission Dam, September. Mission Valley, March. Oceanside, Camp Pendleton, October. Sweetwater River, March (♀ only). Warner Springs, July. SANTA BARBARA CO.: Santa Barbara. *New Mexico*: (♀ only). *Texas*: (♀ only).

For the southern and central groups, females taken without males are considered to be only tentatively identified as to species and/or group.

Central Group × Northern Group, Hybrid Populations: UNITED STATES: *California*: FRESNO CO.: Herndon, August. KERN CO.: Lebec, May. MADERA CO.: Bates Station, March. MONTEREY CO.: Bradley, Salinas River, March. Carmel, February. Pleyto Road at San Antonio River, April. Soledad, August. SANTA BARBARA CO.: Santa Inez Mountains. SAN LUIS OBISPO CO.: 10 mi. W. of Clear Creek, Cuyama Canyon, March (by splashing water on sand). TULARE CO.: Exeter. Kaweah. Woodlake, June (at light).

Northern Group: UNITED STATES: *California*: COLUSA CO.:

SW. of Lodoga, Indian Creek 1.5 mi. on road to Cooks Springs, April. EL DORADO CO.: Penryn. FRESNO CO.: Helm, April. Trimmer, August. MADERA CO.: Clover Meadow—North Fork Road, West Fork Chiquito Creek, 4450′, August. Coarsegold, 2000′, June. Raymond, May. MENDOCINO CO.: Dry Creek, Highway 128, September. NAPA CO.: Pope Creek at Walter Springs road, 520′, August. PLACER CO.: Squaw Valley, June. SAN JOAQUIN CO.: Mendota, April. SAN LUIS OBISPO CO.: Santa Margarita. TULARE CO.: 9.5 mi. N. of Kernville, Kern River, March.

Chaetarthria ochra, new species
(Figures 102, 103, 104, 105, 107)

DIAGNOSIS: The generally pale yellow dorsum, usually lacking darker markings except for the black head and often brown elytral humeri and scutellum, will separate most specimens of this species, as other yellowish species generally have at least some clouding or marking with brown or black on the pronotum and/or the elytral disc. The elytral length is generally from 1.6 to 1.8 mm, larger than most yellowish species sympatric with *ochra*, and the overall appearance of *ochra* is usually a little more robust.

The aedeagus of this species is very similar to that of *bicolor* but has the wing shaped parameres smaller and their outer angles more divergent. The male protibiae are also similar to those of *bicolor* but are slightly elbowed on the inner margin near the apex instead of being sinuate (largely due to an apical bulge) as in *bicolor*, and in having the stalked disc proximad of the apex.

DISTRIBUTION: Mendocino County, California, east to Santa Cruz County, Arizona and south to Sonora, Mexico.

HOLOTYPE: Male, Salinas River, Bradley, Monterey County, California, March 8, 1937, H. B. Leech (CA). Shape broadly oval, fairly convex. Head black, coarsely, irregularly and rather sparsely punctate except labrum with many fine punctures, no micropunctation between major punctures, almost no vestiture. Pronotum, scutellum and elytra yellow, lacking dark markings except scutellum slightly darker, pronotum shallowly and fairly sparsely punctate, no micropunctation between major punctures, nearly glabrous, elytra more thickly punctate, in alternate somewhat regular and quite irregular rows, punctures of irregular rows bearing very fine hairs, apex of each elytron with five short, shallowly impressed longitudinal grooves in addition to sutural stria, sutural striae traceable nearly three-quarters of way from apex to base. Ventral surface black except antennae, palpi, prosternum and legs yellow, metasternum with

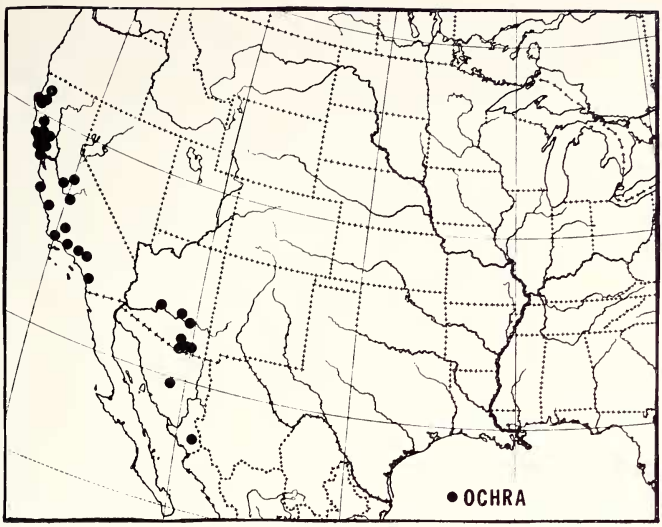


FIG. 107. Distribution of *Chaetarthria ochra*.

row of yellowish bristles, larger than surrounding vestiture, in posterior quarter on either side of flat medial area. Protibiae in anterior view widening from base for about four-fifths of length, then inner margin curved so sides convergent to apex, apex rounded, protibiae about four times as long as greatest width, medial face of apical portion with single stalked disc near elbow. Aedeagus in dorsal view with each paramere a small triangle with one side at aedeagal apex; penis visible extending beyond parameres, filiform, flanked on each side by spine-like extension of inner corner of paramere; basal piece elongate, nearly parallel sided except narrowest in quarter forming juncture with parameres; in lateral view basal piece slightly concave ventrally, if straightened out would be nearly six times length of parameres; parameres thin, flat; penis extending beyond parameres on same plane. EL 1.75 mm., GW 1.35 mm., GH .74 mm., GW/EL .77, GH/EL .42, PL .09 mm.

ALLOTYPE: Female, same data as holotype (CA). Externally like male except lacking secondary sexual modifications of protibiae and metasternum. EL 1.75 mm., GW 1.58 mm., GH .74 mm., GW/EL .81, GH/EL .42.

VARIATION: The penis can be extended or retracted and thus protrudes various lengths beyond the parameres. The dorsum, excluding the black head, has never been seen to have brown clouding

or markings except on the elytral humeri and the scutellum, but occasionally the pronotal disc is somewhat transparent and shows underlying structures, thus appearing somewhat clouded. The larger setae on the metasternum of the males are less obvious than in the other species of the group, being often difficult to observe and sometimes apparently absent.

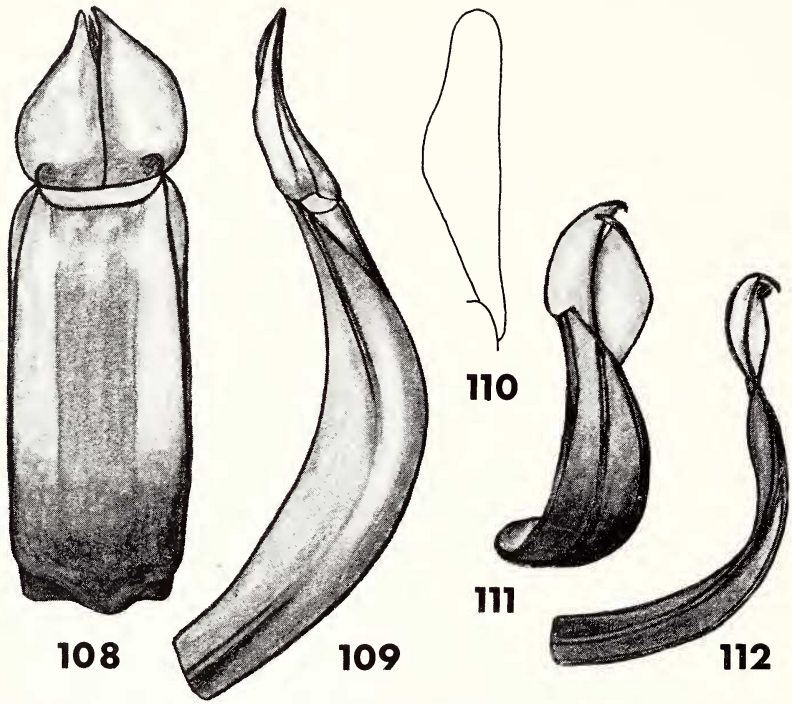
One male, from the Mad River, Trinity County, California (CA) has two stalked discs on the right protibia but only the normal one on the left. This specimen is excluded from the paratypes. The aedeagus is normal for the species.

PARATYPES AND FEMALE: (total 98 ♂♂, paratypes unless otherwise noted, 128 ♀♀, not paratypes): MEXICO: *Sonora*: Alamos, 4 ♂♂, August 12, 1960, P. H. Arnaud Jr., E. S. Ross, D. C. Rentz (CA, DM), February (♀ only). 30 mi. E. of Ures, 19 ♂♂, 23 ♀♀, August 12, 1969, B. S. Cheary (black light) (BM, DM). UNITED STATES: *Arizona*: COCHISE CO.: Sierra Vista, Huachuca Mts., 1 ♂, March, 1965, R. F. Sternitzky (CNC). MARICOPA CO.: Phoenix, 1 ♂, August 3, 1917 (CU), 1 ♂, 1 ♀, July, Wickham (MCZ). PIMA CO.: Tucson, 1 ♂, August 5, 1935, Bryant (CA). PINAL CO.: Riverside, 1 ♂, Wickham (USNM). Superior, 2 ♂♂, 4 ♀♀, July 27, 1948, H. K. Gloyd (light) (INHS). SANTA CRUZ CO.: Harshaw, July (♀ only). Nogales, 5 ♂♂, 7 ♀♀, August 16, 1940 and August 16, 1942, F. W. Nunenmacher (CA, CNHM). Patagonia, 2 ♂♂, 1 ♀, July 10, 1936 (CA), 1 ♂, July 5, 1936 (UCB). Patagonia, Sonita River, 1 ♂, 2 ♀♀, July 18, 1948, C. and P. Vaurie (AMNH). Patagonia Mountains, 1 ♂, July 30, 1957, D. J. and J. N. Knull (OSU). Santa Rita Mountains, July (♀ only). YUMA CO.: Yuma ("Ft. Yuma") (♀ only). *California*: COLUSA CO.: Bear Valley, Bear Creek at Bartlett Springs Road, 2 ♂♂, April 9, 1971, Hugh B. Leech (CA). SW. of Lodoga, Indian Creek 1.5 mi. on road to Cooks Springs, 1 ♂, April 7, 1971, Hugh B. Leech (CA). 6 mi. S. of Stonyford, Little Stony Creek, March (♀ only). FRESNO CO.: Herndon, 2 ♂♂, 1 ♀, August 20, 1918, J. O. Martin (CA). Mendota, 1 ♂, 1 ♀, April 1 (CA). HUMBOLDT CO.: 2.5 mi. N. of road to Hoopa, Toss-up Creek, confluence with Redwood Creek, 650′, 1 ♂, August 13, 1970, Hugh B. Leech (CA). LAKE CO.: 1.7 mi. W. of Kelseyville, Kelsey Creek at Gross Ford, 2 ♂♂, 5 ♀♀, October 11, 1964, H. B. Leech (CA, DM). LOS ANGELES CO.: Rincon, San Gabriel River, Station 1800′, 1 ♂, September 26, 1970, P. D. Perkins (PP). San Fernando, 1 ♂, F. Winters (CA, not paratype, damaged, no genitalia). Whittier, Rio Hondo, September (♀ only). MARIN CO.: Lagunitas, 1 ♂, 1,000′, May 11, 1942, H. P. Chandler (CA).

MENDOCINO CO.: Dry Creek, Highway 128, 1 ♂, 1 ♀, September 5, 1964, Hugh B. Leech (CA). Philo, June (♀ only). 2 mi. S. Yorkville, Rancheria Creek, 2 ♂♂, 3 ♀♀, July 24, 1954, Hugh B. Leech (CA). MONTEREY CO.: Carmel, February, April (♀ only). Monterey, 1 ♂, June 24, 1916, J. O. Martin (CA). NAPA CO.: Pope Creek at Walter Springs Road, 520′, August (♀ only). St. Helena, 1 ♂, July 15 (MCZ). SAN BERNARDINO CO.: Hesperia, June (♀ only). Near Victorville, Mojave River, February (♀ only). SAN DIEGO CO.: Oceanside, Camp Pendleton, 1 ♂, 300′, October 24, 1945, H. P. Chandler (CA). SAN LUIS OBISPO CO.: 10 mi. W. of Clear Creek, Cuyama Canyon, 1 ♂, 2 ♀♀, March 7, 1937, Hugh B. Leech (by splashing water on sand) (CA). Santa Margarita, June (♀ only). SANTA BARBARA CO.: Santa Barbara, 3 ♂♂, 1 ♀ (CA, CU, RBM). Santa Ynez Mts. (♀ only). Santa Ynez (♀ only). SONOMA CO.: Annapolis and Stewarts Point—Healdsburg Road, Wheatfield Branch of Gualala River at bridge, 3 ♂♂, 3 ♀♀, September 7, 1964, Hugh B. Leech (CA, DM). N. road to Annapolis, S. Fork Gualala River, at bridge, 6 ♂♂, 7 ♀♀, October 12, 1964, Hugh B. Leech (CA, DM). 3 mi. S. of Cazadero, Austin Creek, 1 ♂, 1 ♀, April 15, 1950, Hugh B. Leech (CA). Duncan Mills, 2 ♂♂, June 28 and July 9, 1908, F. E. Blaisdell (CA). Guerneville, July (♀ only). TRINITY CO.: bridge near Carrier Gulch, Wildwood Road, Hayfork Creek (♀ only). Hayfork-Wildwood Road, Hayfork Creek, 5 ♂♂, 4 ♀♀, August 11, 1970 and August 7, 1972, Hugh B. Leech (CA, DM). Hayfork Creek just S. of its East Fork, Alt. 823, m., 5 ♂♂, 1 ♀, August 9, 1972, Hugh B. Leech (CA, DM). 0.5 mi. E. of Hyampom, Hayfork Creek, 5 ♂♂, 8 ♀♀, July 23, 1968, Hugh B. Leech (CA, DM). 4.25 mi. SE. Ruth, Mad River just above mouth Van Horn Creek, 1 ♂, 4 ♀♀, July 23, 1968, Hugh B. Leech (CA, ♂ not paratype, two discs on right protibia). TULARE CO.: Exeter, 1 ♂, 1 ♀ (CA). VENTURA CO.: Filmore, 2 ♂♂, 2 ♀♀, March 21, 1923, Warwick Benedict (KU). County ?: No locality, 1 ♂ (MCZ). State ?: "Locality doubtful," 1 ♂ (MCZ). Data unreadable, 1 ♂ (BS).

Chaetarthria utahensis, new species
(Figures 108, 109, 110, 113)

DIAGNOSIS: This medium sized (elytral length 1.5 to 1.7 mm.) species, which is dorsally brown except for the black head, is quite similar to lighter colored specimens of *C. hespera*, with which it is sympatric. Thus males should be examined for the protibiae, with a single stalked disc, and the aedeagus with the slightly asymmetrical



FIGS. 108–112. Fig. 108. *Chaetarthria utahensis*, aedeagus, dorsal. Fig. 109. same, lateral. Fig. 110. same, left protibia, anterior face. Fig. 111. *C. punctulata*, aedeagus, dorsal. Fig. 112. same, lateral.

parameres. The closely related *C. punctulata* is smaller (elytral length generally under 1.5 mm.) but has the aedeagus and protibiae similar to those of *utahensis*.

DISTRIBUTION: Known only from Chad's Ranch, (on Santa Clara Creek, near Veyo, Washington County), Utah.

HOLOTYPE: Male, Chad's Ranch, near Veyo, Washington Co., Utah, July 22, Wickham (USNM). Shape oval, fairly convex. Head black, nearly impunctate except labrum with many fine punctures, lacking micropunctation, vestiture a few very fine hairs. Pronotum, scutellum and elytra reddish brown, slightly and vaguely paler at sides of pronotum and elytral apex, pronotum shining, nearly entirely lacking punctation and vestiture, no micropunctation, elytra with large, very shallow punctures arranged in vaguely regular series, vestiture fairly sparse, of very fine hairs, elytral apex lacking grooves or raised areas, sutural striae traceable about three-quarters of way

from apex to base. Ventral surface reddish brown except antennae, palpi, prosternum and legs paler and more yellowish, metasternum with row of yellowish bristles, larger than surrounding vestiture, on posterior quarter on either side of flat medial area. Protibiae in anterior view broadening from base for about half of length, then inner margin fairly sharply elbowed so margins convergent to apex, about four times as long as greatest width, medial face of apical portion with single stalked disc set in slight depression near the angle. Aedeagus in dorsal view with parameres together forming triangle with its apex posterior, right paramere slightly larger than left, junction of parameres to basal piece slanting; penis not visible; basal piece elongate, parallel sided, with a narrow flange on each side; in lateral view basal piece somewhat concave ventrally, if straightened out would be somewhat over three times length of parameres; parameres thin, somewhat concave dorsally. EL 1.66 mm., GW 1.31 mm., GH .75 mm., GW/EL .79, GH/EL .45, PL .23 mm.

FEMALE: Unknown.

VARIATION: The intact paratype is a lighter, less reddish brown than the holotype, and appears to be slightly teneral.

PARATYPES: 2 ♂♂, data as holotype (CA, DM). The specimen retained in the author's collection consists only of an aedeagus, the remainder of the beetle having been destroyed.

Chaetarthria punctulata Sharp
(Figures 111, 112, 113)

Chaetarthria punctulata Sharp, 1882, p. 87. Type locality: "Cordova" (Cordoba), Veracruz, Mexico (Salle). Type male in British Museum (Natural History), examined by Mr. Harry Kenward for this study.

Chaetarthria minor: Schwarz, 1914, p. 165 (not Fall). I suspect that this is the species Schwarz had, but am not certain of it.

DIAGNOSIS: Females of this species are difficult to separate from other dark colored, New World *Chaetarthria* which overlap it in range. The elytral length (generally 1.28 to 1.50 mm.) overlaps that of large *pusilla* or of small *nigrella* or *hespera*. Specimens of *nigrella*, however, are very weakly to rather strongly micropunctate between the major punctures on the pronotum, while all the other species mentioned above are smooth between the major punctures. Also *nigrella*, where it is sympatric with *punctulata*, usually has a pale elytral apex. The male protibiae, each with a single stalked disc, will separate *punctulata* from all other dark species in its area. The larger *utahensis* (elytral length 1.5 to 1.7 mm.) is similar and almost

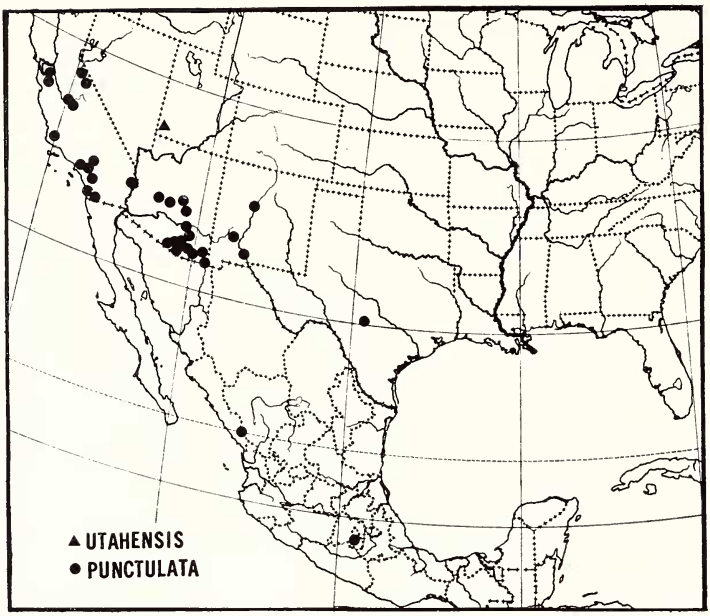


FIG. 113. Distribution of *Chaetarthria utahensis* and *C. punctulata.*

sympatric with *punctulata.* However it has the parameres much less asymmetrical than in *punctulata.*

DISTRIBUTION: Southern California east to Texas and south to the states of Mexico and Veracruz, Mexico.

MALE [based on specimen from Tejupilco, Temescaltepec, Mexico State, Mexico, June 17, 1933, H. E. Hinton and R. L. Usinger (BM)]: Shape oval, somewhat convex. Head black, nearly glabrous, punctation very fine and sparse except labrum with many fine punctures, lacking micropunctures. Pronotum, scutellum and elytra reddish brown, pronotum nearly glabrous and with only a few very fine punctures, no micropunctation between major punctures, elytra thickly and fairly coarsely punctate, punctures in somewhat regular rows and most bearing a fine hair, elytral apex lacking grooves or raised areas, sutural striae traceable about half way from apex to base. Ventral surface dark reddish brown except palpi, antennae, prosternum and legs paler, metasternum with row of yellowish bristles larger than surrounding vestiture, in posterior third on either side of flat medial area. Protibiae in anterior view widening sharply from base for about two-thirds of length, then medial margin elbowed so sides roughly parallel to apex, medial face of apical portion with

single stalked disc near elbow. Aedeagus in dorsal view with parameres each roughly a triangle with point at apex of aedeagus, left paramere considerably larger than right, both joining basal piece on slant; penis not visible; basal piece roughly parallel sided, elongate; in lateral view basal piece strongly concave ventrally, if straightened out would be about twice length of parameres; parameres very thin, curving dorsally at tip.

FEMALE [based on specimen with same data as male above (BM)]: Externally like male except head and pronotum somewhat more coarsely punctate, and lacking secondary sexual modifications of protibiae and metasternum.

VARIATION: Dorsal color varies from fairly light reddish brown to nearly black. Punctation varies somewhat and the difference noted between the described male and female above is not consistent in other specimens. The position of the angle on the male protibia varies from about the midpoint, in specimens from the United States, to two thirds of the way to the apex, in Mexican specimens.

SPECIMENS EXAMINED: 117 males, 111 females, about 40 not sexed. MEXICO: *Baja California*: 5.7 mi. E. Hamilton Ranch, Arroyo Santo Domingo, dam site, April (♀ only). La Suerta, Sierra San Pedro Martir, 3700′, June (pool on canyon) (♀ only). *Mexico*: Real de Arriba, Temescaltepec, July. Tejupilco, Temescaltepec, June. *Sinaloa*: 27 mi. E. Villa Unión, July. UNITED STATES: *Arizona*: COCHISE CO.: Guadelupe Canyon, Guadelupe Mountains, June. 5 mi. W. Portal, South West Research Station, 5400′, July, August. Parker Canyon Lake, July. Rucker Creek 8 mi. below Rucker Lake, April (♀ only). St. David, July (small shallow pool) (♀ only). Sunnyside Canyon W. side Huachuca Mountains, 6000′, August (♀ only). GILA CO.: 19 mi. N. Roosevelt, Sycamore Creek, April. MARICOPA CO.: 3 mi. S. Cave Creek, June (light trap). Wickenberg, August (light trap). PIMA CO.: Arivaca, September. Catalina Mountains (♀ only). Gardiner Canyon, Santa Rita Mountains, February. Molino Basin, August (♀ only). Sabino Canyon, Santa Catalina Mountains, December. Tucson, March, April, September. PINAL CO.: 24 mi. W. Casa Grande, September (♀ only). Riverside. Superior, Boyce Thompson Arboretum, July, September (light trap). SANTA CRUZ CO.: 3 mi. W. Fort Huachuca, May. Madera Canyon, Santa Rita Mountains, August (at light). 15 mi. W. Nogales, June (♀ only). 15 mi. NW. Nogales, Peña Blanca Lake, April, May. Ruby, July. Sycamore Canyon, Tumacacori Mountains, Yanks' Spring, August. County ?: Catalina Springs. *California*: FRESNO CO.: Kings River Camp, August. INYO CO.: Deep Springs Valley, Buckhorn Springs, January. Shoshone (♀ only). LOS ANGELES CO.:

Littlerock, Mojave desert (♀ only). Pasadena, June. Saugus, Soledad Canyon, August (♀ only). MONO CO.: Benton Hot Springs, January. RIVERSIDE CO.: E. of Lake Hemet, Garner Valley, San Jacinto Mountains, October (sedges, wet soil). Riverside. SAN BERNARDINO CO.: 7 mi. SW. Parker Dam, February. Near Victorville, Mojave River, February. SAN DIEGO CO.: Mission Dam, September (♀ only). Pine Valley, April (♀ only). Poway. San Mateo Canyon, October (under willow, berlese funnel). The Willows, June. SAN LUIS OBISPO CO.: Nacimiento Reservoir, Bee Rock Campground, July (black light, nearly full moon) (♀ only). SANTA BARBARA CO.: Santa Ynez Mountains (♀ only). 10 mi. E. Santa Maria, Cuyama River, July. SANTA CLARA CO.: Mount Hamilton, August. STANISLAUS CO.: Del Puerto Creek, 4 mi. W. of Route 5, September. TULARE CO.: Kaweah, April. *New Mexico*: BERNALILLO CO.: Albuquerque. DONA ANA CO.: Mesilla Dam, April. SIERRA CO.: 4 mi. E. Hillsboro, Piedra River Gorge, Mimbres Mountains, August. *Texas*: CULBERTSON CO.: 2.5 mi. E. Nickel Creek Station, September (♀ only). KERR CO.: Kerrville, April (light trap). Females taken without males are only tentatively identified.

SPECIMENS OF UNCERTAIN PLACEMENT

Chaetarthria seminulum (Herbst)

A single female labeled Montreal, Quebec, March 27, 1916, J. I. Beauline (CNC) appears to belong to this European species. It probably represents either a specimen mislabeled with respect to locality or an isolated introduction of the species into North America, which has failed to establish a population.

Species A

Three females from Corumba, Matto Grosso, Brazil (RBM) appear to be very similar to *C. glabra* except that they are somewhat less robust (greatest width/elytral length .86 to .90, greatest height/elytral length .53 to .63 as compared with .95 to 1.02 and .67 to .79 for the same ratios in *glabra*). Since no other species of *Chaetarthria* is known to occur in both Central and South America, I doubt that these specimens are *glabra*. They may represent an unnamed species of the *glabra* group. I have deferred naming them until males are found, and have labeled them "Species A."

Species B

Three females from 8 miles Southeast of Liberia, Guanacaste, Costa Rica (USNM) are similar to *C. pusilla* in size but slightly

TABLES OF MEASUREMENTS

TABLE I—MEASUREMENTS OF MALES AND FEMALES

Measurements are in millimeters. For each species the mean, standard deviation, range and number of specimens measured are given in that order.

Species	Elytral Length	Greatest Width / Elytral Length	Greatest Height / Elytral Length
glabra			
males	1.05 ± .02 (1.02–1.09) 10	.99 ± .01 (.98–1.00) 10	.73 ± .03 (.68–.76) 10
females	1.07 ± .05 (.98–1.17) 10	.98 ± .02 (.95–1.02) 10	.70 ± .08 (.67–.79) 10
hintoni			
male	1.09 1	.89 1	.58 1
females	1.14 ± .05 (1.09–1.14) 3	.89 ± .04 (.86– .94) 3	.61 ± .02 (.58–.62) 3
laeticula			
males	1.06 ± .09 (1.00–1.12) 2	.89 (both) 2	.57 ± .01 (.56–.58) 2
females	1.04 ± .14 (.95–1.14) 2	.94 ± .03 (.92– .96) 2	.56 ± .01 (.55–.57) 2
truncata			
males	1.39 ± .06 (1.28–1.45) 10	.81 ± .03 (.78– .86) 10	.53 ± .02 (.51–.55) 10
female	1.51 1	.80 1	.58 1
nigrella			
males	1.47 ± .09 (1.35–1.61) 20	.81 ± .04 (.74– .92) 20	.49 ± .03 (.44–.55) 20
females	1.52 ± .07 (1.38–1.65) 20	.82 ± .04 (.78– .90) 20	.51 ± .02 (.47–.54) 20
atra			
males	1.67 ± .06 (1.54–1.75) 13	.82 ± .04 (.77– .91) 13	.51 ± .05 (.42–.59) 13
females	1.72 ± .09 (1.54–1.86) 12	.83 ± .04 (.77– .91) 12	.52 ± .03 (.47–.59) 12

TABLE I (continued)

Species	Elytral Length	Greatest Width / Elytral Length	Greatest Height / Elytral Length
atroides			
males	1.87 ± .07 (1.80–1.98) 8	.78 ± .02 (.75– .81) 8	.49 ± .02 (.46–.52) 8
females	1.82 ± .07 (1.70–1.93) 9	.81 ± .02 (.78– .84) 9	.52 ± .02 (.49–.56) 9
hespera			
males	1.71 ± .10 (1.49–1.74) 20	.80 ± .04 (.73– .88) 20	.47 ± .04 (.40–.53) 20
females	1.68 ± .10 (1.52–1.84) 20	.82 ± .03 (.76– .86) 20	.49 ± .03 (.44–.54) 20
spinata			
males	1.90 ± .13 (1.68–2.15) 10	.85 ± .04 (.77– .90) 10	.49 ± .03 (.44–.54) 10
females	1.82 ± .11 (1.61–1.93) 11	.86 ± .05 (.80– .97) 11	.50 ± .03 (.46–.54) 11
leechi			
males	2.05 ± .22 (1.75–2.14) 3	.80 ± .07 (.75– .88) 3	.45 ± .05 (.42–.50) 3
female	2.01 1	.78 1	.45 1
pusilla			
north			
males	1.20 ± .04 (1.12–1.28) 17	.79 ± .03 (.74– .85) 17	.47 ± .02 (.44–.50) 17
females	1.21 ± .05 (1.16–1.31) 11	.79 ± .03 (.74– .86) 11	.50 ± .02 (.46–.54) 11
south			
males	1.03 ± .08 (.93–1.16) 12	.84 ± .05 (.77– .93) 12	.52 ± .04 (.44–.58) 12
females	1.06 ± .06 (.97–1.12) 10	.82 ± .03 (.75– .86) 10	.54 ± .02 (.51–.58) 10
brasilia			
males	1.18 ± .07 (1.05–1.30) 20	.80 ± .04 (.73– .90) 20	.53 ± .02 (.51–.57) 20
females	1.23 ± .06 (1.12–1.35) 20	.79 ± .03 (.73– .84) 20	.54 ± .02 (.50–.59) 20

TABLE I (continued)

Species	Elytral Length		Greatest Width / Elytral Length		Greatest Height / Elytral Length	
lateralis						
male	1.66	1	.76	1	.51	1
females	1.72 (both)	2	.77 (both)	2	.51 ± .01 (.50–.52)	2
pallida						
west						
males	1.31 ± .07 (1.14–1.44)	20	.79 ± .03 (.76– .86)	20	.49 ± .02 (.45–.53)	20
females	1.34 ± .10 (1.09–1.52)	20	.80 ± .04 (.75– .91)	20	.50 ± .03 (.44–.56)	20
central						
males	1.35 ± .08 (1.26–1.58)	20	.82 ± .04 (.76– .89)	20	.50 ± .04 (.44–.56)	20
females	1.43 ± .10 (1.26–1.56)	20	.83 ± .03 (.76– .88)	20	.51 ± .03 (.47–.56)	20
Florida						
males	1.28 ± .07 (1.14–1.36)	20	.82 ± .03 (.77– .89)	20	.43 ± .03 (.49–.60)	20
females	1.35 ± .10 (1.10–1.49)	20	.81 ± .03 (.76– .87)	20	.54 ± .02 (.50–.59)	20
pamphila						
males	1.22 ± .08 (1.09–1.33)	18	.82 ± .03 (.77– .89)	18	.51 ± .04 (.47–.58)	18
females	1.25 ± .10 (1.09–1.38)	9	.81 ± .06 (.75– .95)	9	.50 ± .03 (.45–.53)	9
hermani						
males	1.39 ± .19 (1.13–1.49)	5	.81 ± .06 (.76– .88)	5	.50 ± .03 (.47–.54)	5
females	1.44 ± .08 (1.33–1.49)	6	.82 ± .03 (.78– .86)	6	.53 ± .01 (.51–.55)	6
argentina						
males	1.46 ± .05 (1.35–1.56)	20	.81 ± .03 (.77– .88)	20	.47 ± .03 (.43–.53)	20
females	1.54 ± .08 (1.35–1.68)	20	.80 ± .02 (.77– .83)	20	.50 ± .02 (.47–.53)	20

TABLE I (continued)

Species	Elytral Length	Greatest Width / Elytral Length	Greatest Height / Elytral Length
pamphiloides			
males	1.26 ± .25 (1.08–1.44) 2	.82 ± .04 (.79– .84) 2	.52 ± .06 (.48–.56) 2
female	1.41 1	.80 1	.51 1
panda			
males	1.57 ± .09 (1.44–1.75) 20	.84 ± .03 (.78– .89) 20	.50 ± .03 (.47–.54) 20
females	1.60 ± .08 (1.47–1.75) 20	.82 ± .04 (.77– .88) 20	.48 ± .02 (.45–.52) 20
malkini			
males	1.31 ± .06 (1.17–1.40) 18	.81 ± .04 (.74– .88) 18	.49 ± .03 (.45–.54) 18
females	1.30 ± .05 (1.21–1.40) 17	.82 ± .03 (.77– .87) 17	.52 ± .03 (.49–.57) 17
goldbachi			
Argentina			
males	1.65 ± .06 (1.54–1.79) 20	.79 ± .02 (.75– .82) 20	.46 ± .02 (.41–.49) 20
females	1.64 ± .06 (1.51–1.75) 20	.80 ± .02 (.76– .85) 20	.48 ± .03 (.43–.52) 20
Brazil			
males	1.36 ± .06 (1.23–1.45) 20	.79 ± .03 (.75– .85) 20	.45 ± .03 (.38–.51) 20
females	1.27 ± .09 (1.12–1.45) 20	.80 ± .03 (.75– .82) 20	.48 ± .03 (.45–.53) 20
bruchi			
males	1.62 ± .07 (1.45–1.73) 20	.81 ± .02 (.76– .85) 20	.48 ± .03 (.44–.53) 20
females	1.69 ± .05 (1.61–1.75) 20	.82 ± .02 (.80– .88) 20	.49 ± .02 (.46–.54) 20
spangleri			
males	1.60 ± .08 (1.45–1.75) 19	.79 ± .03 (.74– .86) 19	.44 ± .02 (.43–.48) 19
females	1.55 ± .11 (1.38–1.77) 22	.79 ± .02 (.76– .84) 22	.46 ± .03 (.41–.52) 22

TABLE I (continued)

Species	Elytral Length	Greatest Width / Elytral Length	Greatest Height / Elytral Length
magna			
males	1.87 ± .08 (1.65–1.96) 20	.81 ± .02 (.77– .85) 20	.45 ± .02 (.42–.48) 20
females	1.93 ± .10 (1.66–2.12) 20	.80 ± .02 (.77– .86) 20	.46 ± .02 (.42–.48) 20
flava			
males	1.43 ± .06 (1.33–1.51) 20	.81 ± .02 (.75– .84) 20	.44 ± .03 (.40–.51) 20
females	1.53 ± .08 (1.44–1.77) 20	.80 ± .02 (.76– .85) 20	.46 ± .03 (.42–.54) 20
veracruzensis			
males	1.45 ± .04 (1.42–1.49) 3	.81 ± .02 (.78– .82) 3	.45 ± .02 (.43–.46) 3
females	1.53 ± .04 (1.51–1.56) 2	.81 ± .03 (.79– .83) 2	.48 ± .02 (.46–.49) 2
granulata			
males	1.04 ± .05 (.96–1.12) 20	.79 ± .02 (.75– .83) 20	.48 ± .02 (.44–.52) 20
females	1.07 ± .05 (.98–1.14) 20	.79 ± .01 (.76– .81) 20	.48 ± .02 (.45–.51) 20
major			
males	1.72 ± .08 (1.56–1.82) 8	.80 ± .01 (.78– .82) 8	.45 ± .02 (.42–.48) 8
females	1.82 ± .08 (1.72–1.98) 13	.80 ± .03 (.75– .85) 13	.46 ± .02 (.42–.49) 13
bicolor			
north			
males	1.40 ± .06 (1.31–1.49) 17	.77 ± .02 (.73– .80) 17	.45 ± .02 (.43–.49) 17
females	1.42 ± .08 (1.24–1.56) 20	.79 ± .02 (.75– .84) 20	.47 ± .02 (.45–.50) 20
no. × cent.			
males	1.44 ± .06 (1.33–1.54) 13	.79 ± .02 (.76– .83) 13	.46 ± .04 (.42–.57) 13
females	1.48 ± .08 (1.33–1.63) 13	.79 ± .02 (.75– .82) 13	.46 ± .02 (.42–.49) 13

TABLE I (continued)

Species	Elytral Length	Greatest Width / Elytral Length	Greatest Height / Elytral Length
central			
males	1.51 ± .07 (1.44–1.61) 20	.77 ± .03 (.73– .80) 20	.44 ± .01 (.42–.47) 20
females	1.48 ± .09 (1.24–1.63) 20	.79 ± .02 (.76– .84) 20	.47 ± .03 (.41–.53) 20
south			
males	1.34 ± .05 (1.26–1.45) 20	.79 ± .02 (.75– .82) 20	.46 ± .02 (.42–.51) 20
females	1.40 ± .07 (1.22–1.49) 20	.79 ± .02 (.75– .83) 20	.47 ± .02 (.43–.51) 20
ochra			
males	1.71 ± .07 (1.59–1.82) 20	.81 ± .04 (.74– .97) 20	.44 ± .02 (.39–.48) 20
females	1.76 ± .07 (1.66–1.91) 20	.79 ± .02 (.76– .84) 20	.44 ± .02 (.41–.47) 20
utahensis			
males	1.59 ± .10 (1.52–1.66) 2	.80 ± .01 (.79– .81) 2	.49 ± .05 (.42–.52) 2
punctulata			
males	1.37 ± .07 (1.26–1.49) 20	.80 ± .02 (.75– .85) 20	.46 ± .03 (.42–.52) 20
females	1.43 ± .06 (1.33–1.54) 20	.80 ± .02 (.76– .84) 20	.48 ± .04 (.45–.60) 20
Species A			
females	1.19 ± .07 (1.14–1.29) 3	.88 ± .02 (.86– .90) 3	.58 ± .05 (.53–.63) 3
Species B			
females	1.11 ± .03 (1.09–1.14) 3	.79 (all) 3	.47 ± .01 (.46–.48) 3

TABLE II—MEASUREMENTS OF MALES ONLY

Paramere measurements are in millimeters, protibial are counts of plates or discs. For each species the mean, range and number of specimens measured are given in that order.

Species	Paramere length	Protibial Plates or Discs
glabra	.19 ± .01 (.18–.21) 10	None
hintoni	.18 1	None
laeticula	.23 ± .02 (.21–.25) 2	None
truncata	.26 ± .02 (.25–.32) 10	None
nigrella	.18 ± .01 (.17–.19) 20	1 large spine
atra	.27 ± .01 (.26–.28) 13	9.8 ± .6 (9–11) 13
atroides	.42 ± .01 (.40–.44) 7	7.3 ± .5 (7– 8) 8
hespera	.16 ± .01 (.16–.19) 20	5.2 ± .6 (4– 7) 20
spinata	.23 ± .01 (.23–.26) 10	11.0 ± 1.1 (10–13) 10
leechi	.40 ± .02 (.39–.42) 3	9.0 ± 1.0 (8–10) 3
pusilla		
north	.09 (all) 17	5.7 ± .5 (5– 6) 17
south	.08 ± .01 (.07–.09) 11	5.3 ± .5 (5– 6) 10
brasilia	.22 ± .01 (.21–.25) 20	2.1 ± .2 (2– 3) 20
lateralis	.35 1	10 1
pallida		
west	.23 ± .01 (.21–.24) 20	3 (all) 20
central	.18 ± .01 (.16–.19) 20	3 (all) 20
Florida	.17 ± .01 (.16–.18) 20	3 (all) 20
pamphila	.16 ± .01 (.16–.18) 18	4.9 ± .3 (4– 5) 18
hermani	.23 (all) 5	4 (all) 5
argentina	.21 ± .01 (.19–.23) 20	5.0 ± .1 (4– 6) 20
pamphiloides	.23 1	6.5 ± .7 (6– 7) 2
panda	.34 ± .04 (.26–.39) 20	7.8 ± .5 (7– 9) 20
malkini	.22 ± .01 (.21–.23) 18	7.4 ± .7 (6– 9) 18
goldbachi		
Argentina	.32 ± .01 (.30–.33) 20	9.7 ± .7 (9–11) 20
Brazil	.30 ± .02 (.28–.32) 20	7.7 ± .7 (7– 9) 20
bruchi	.30 ± .01 (.28–.32) 16	6.4 ± .6 (6– 8) 19
spangleri	.33 ± .03 (.28–.37) 19	4.7 ± .5 (4– 5) 19
magna	.17 ± .01 (.16–.18) 20	4 (all) 20

TABLE II (continued)

Species	Paramere length		Protibial Plates or Discs	
flava	.25 ± .01 (.23–.26)	20	4 (all)	20
veracruzensis	.23 (all)	3	3 (all)	3
granulata	.10 ± .01 (.09–.12)	20	2 (all)	20
major	.12 ± .01 (.10–.14)	7	2 (all)	8
bicolor				
north	.13 ± .01 (.10–.16)	17	1 (all)	17
no. × cent.	.14 ± .01 (.12–.14)	13	1 (all)	13
central	.19 ± .01 (.16–.22)	20	1 (all)	20
south	.15 ± .02 (.12–.16)	20	1 (all)	20
ochra	.10 ± .01 (.09–.12)	20	1 (all)	20
utahensis	.22 ± .01 (.21–.23)	3	1 (all)	3
punctulata	.16 ± .01 (.14–.18)	20	1 (all)	20

larger (elytral length 1.08 to 1.14 mm. as compared to .93 to 1.14 mm. for southern group *pusilla*), and in shape and color. However they have the elytral vestiture much more evident, that is as whitish scales in fairly clear longitudinal series. Although they might be aberrant *pusilla* I suspect that they are an unnamed species and have labeled them "Species B" pending the discovery of males.

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Dr. George Byers, University of Kansas (KU)
Dr. Charles Hogue, Los Angeles County Museum (LAM)
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Dr. Charles Triplehorn, Ohio State University (OSU)
Dr. Michael Emsley, The Academy of Natural Sciences, Philadelphia (PAS)
Mr. Philip Perkins, Long Beach, California, personal collection (PP)
Dr. Jeffrey Stibick, Purdue University (PU)
Dr. Roger Damoiseau, Institut Royal des Sciences Naturelles de Belgique (RBM)
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